INDIA RUBBER WORLD

NATURAL & SYNTHETIC

AUGUST, 1947

STERLING S*

LOW THERMAL CONDUCTIVITY

LOW HEAT GENERATION

HIGH RESILIENCE

UNIFORMITY

CABOT

GODFREY L. CABOT, INC. 77 FRANKLIN ST., BOSTON 10, MASS.

*(Semi-Reinforcing Furnace.)

DU PONT THIONEX

TEST DATA ON NATURAL RUBBER STOCK ACCELERATED WITH THIONEX

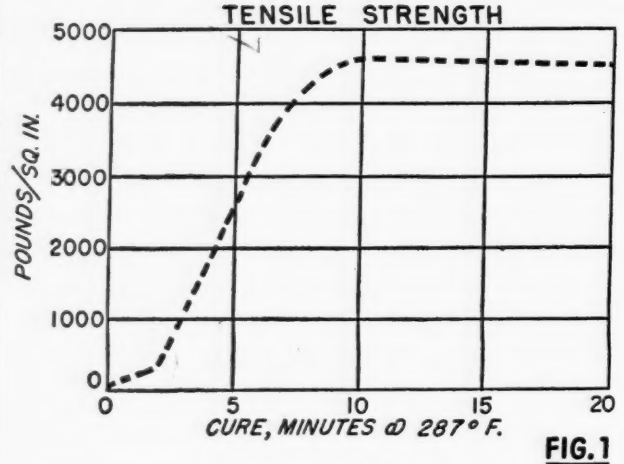

FIG. 1

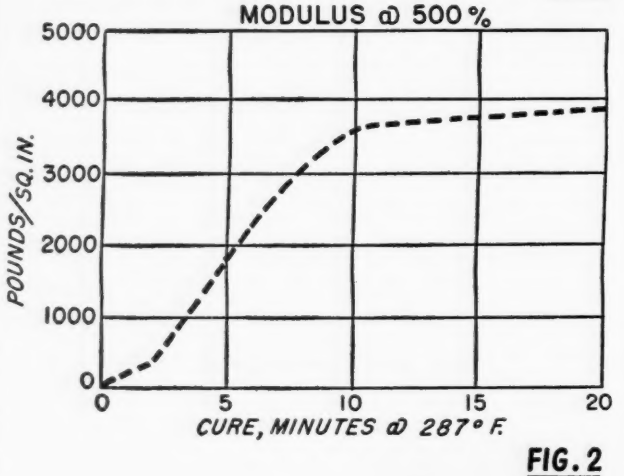

FIG. 2

THE HIGH-SPEED, SAFE ACCELERATOR *for natural rubber stocks*

With Thionex, it is possible to compound fast curing natural rubber stocks that can be processed without scorching. For, unlike other ultra accelerators, Thionex has a delayed action . . . a timed action that starts only after the temperature of the stock reaches curing range. But, at curing temperatures, the rate of cure of stocks containing Thionex is rapidly accelerated. This curing lag makes it possible to process stocks containing Thionex at temperatures close to the temperature of vulcanization, without danger of setting up. In the production of molded goods, Thionex accelerated stocks flow evenly . . . completely fill all sections of mold before vulcanization begins.

Delayed action and the fast curing rate of Thionex in a natural rubber stock are graphically shown by the tensile strength and modulus curves in Figures 1 and 2. The composition of the compound tested is shown in Table 1.

Along with delayed action and fast curing rate, Thionex has other advantages adding to its usefulness in natural rubber compounds.

1. **Compounds accelerated with Thionex have exceptionally good aging characteristics.**
2. **Thionex does not discolor white stocks or affect the shade of compounds containing organic colors; nor does it cause cloudiness in transparent stocks.**
3. **Master batches containing Thionex may be stored indefinitely without deterioration.**
4. **Thionex does not bloom to the surface of stocks that contain it, either before or after vulcanization.**
5. **Thionex is practically insoluble in water and does not affect the insulation resistance of compounds that contain it. This makes it especially valuable for insulated wire stocks.**

These advantages account for the widespread use of Thionex in the production of molded goods, drug sundries, hose, wire insulation, heels and soles, tires and many other rubber products. Write us for detailed information on the use of Thionex in your products.

TABLE 1

Composition of stock used in preparing test data

Smoked Sheets	100.0
Zinc Oxide	5.0
Stearic Acid	1.0
Sulfur	2.0
EPC Carbon Black	50.0
THIONEX	0.3

DU PONT RUBBER CHEMICALS

E. I. du Pont de Nemours & Co., (Inc.), Wilmington 98, Del

BETTER THINGS FOR BETTER LIVING ...THROUGH CHEMISTRY

DU PONT

INDIA RUBBER WORLD, August, 1947. Vol. 116, No. 5. Published Monthly by BILL BROTHERS PUBLISHING CORP. Office of Publication, Orange, Conn., with Editorial and Executive Offices at 386 Fourth Avenue, New York 16, N. Y., U. S. A. Entered as Second-Class Matter at the Post Office at Orange, Conn., under the act of March 3, 1879. Subscription, United States and Mexico, $3.00 per Year. Canada, $4.00; All Other Countries, $5.00; Single Copies 35 Cents. Address Mail to New York Office.

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AUG 20 1947
DETROIT

PERMANENT RESILIENCE

Resilient parts made from HYCAR synthetic rubber *stay* resilient. That's partly because of HYCAR's unusual chemical stability—its resistance to oil and gas, acids and most other chemicals. And parts made from HYCAR are extremely resistant to the effects of oxidation, sunlight, and normal aging. A HYCAR sealing ring, for example, will maintain a positive seal through years of service even when constantly exposed to oils and acids inside the pipe, and sunlight and salt air outside.

Other unusual and valuable properties are listed in the box at the right. But most important, these properties may be had in an almost limitless number of combinations, each designed to meet the specific service conditions of the finished part. Parts made from HYCAR have seen service in *every* industry, giving long life, dependability, and economical operation.

That's why we say ask your supplier for parts made from HYCAR. Test them in your own applications, difficult or routine. You'll learn for yourself that it's wise to use HYCAR for long-time, dependable performance. For more information, please write Dept. HA-8, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio.

CHECK THESE SUPERIOR FEATURES OF HYCAR

1. *EXTREME OIL RESISTANCE — insuring dimensional stability of parts.*
2. *HIGH TEMPERATURE RESISTANCE—up to 250° F. dry heat; up to 300° F. hot oil.*
3. *ABRASION RESISTANCE—50% greater than natural rubber.*
4. *MINIMUM COLD FLOW—even at elevated temperatures.*
5. *LOW TEMPERATURE FLEXIBILITY — down to —65° F.*
6. *LIGHT WEIGHT—15% to 25% lighter than many other synthetic rubbers.*
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8. *HARDNESS RANGE—compounds can be varied from extremely soft to bone hard.*
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Reg. U. S. Pat. Off.
American Rubber

B. F. Goodrich Chemical Company
A DIVISION OF THE B. F. GOODRICH COMPANY

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Everyone, but everyone, loves our new baby! Manufacturers who have tried this wonderful new black are charmed with the way this baby behaves! And we've put him through all sorts of tests ourselves . . . and the results are something to brag about!

Take abrasion resistance, for instance. Rubber products made with this new black wear wonderfully . . . stand friction marvelously well! We especially commend Philblack-O to the attention of tire manufacturers. Philblack-O has what it takes to help tires roll up long mileage records!

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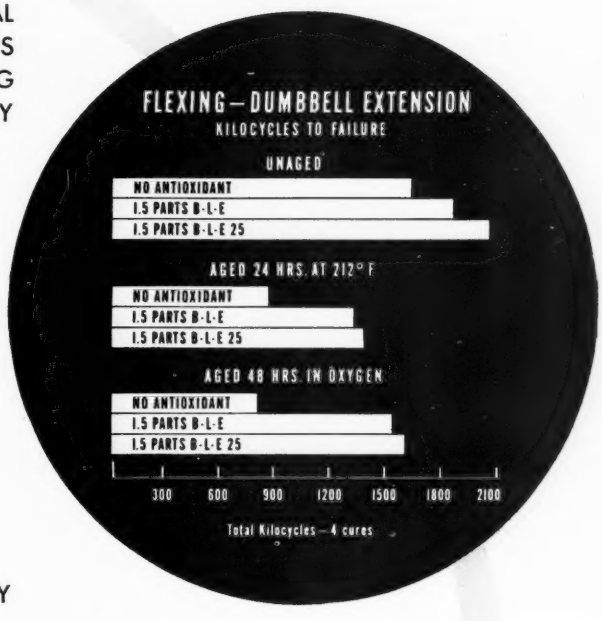

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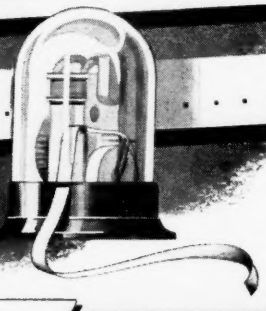

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1. As a whole, for operation at present site;

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If the entire Plancor, except dwellings, not offered at this time, is sold for dismantling and removal from site, the dwellings will be offered at a later date.

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. DESIGNED CAPACITY . .

Approximately 15,000,000 pounds of carbon black per year.

. BUILDINGS & FACILITIES . .

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. . DELIVERY STATUS . .

Panhandle Carbon Company now operates this facility under an interim lease cancellable on 30 days' notice.

. . GAS SUPPLIES . . .

Gas is now being supplied by Phillips Petroleum Company under a contract with the present lessee, that runs through December 31, 1949.

Permits for use of natural gas in the manufacture of carbon black are issued by the Oil Conservation Commission of the State of New Mexico.

A prospective lessee or purchaser for operation of all or part of the Plancor at its present location should make his own arrangements to obtain necessary gas supplies.

. . SEALED BIDS . . . . .

Your sealed proposals on Standard Bid Forms will be received by War Assets Administration, Office of Real Property Disposal, 728 Fifteenth Street, Denver, Colorado, until 2:00 P.M., M.S.T., September 17, 1947, at which time all proposals will be publicly opened and read. Credit terms may be arranged. War Assets Administration reserves the right to reject any or all proposals. For a more detailed description of this property and for Standard Bid Forms write:

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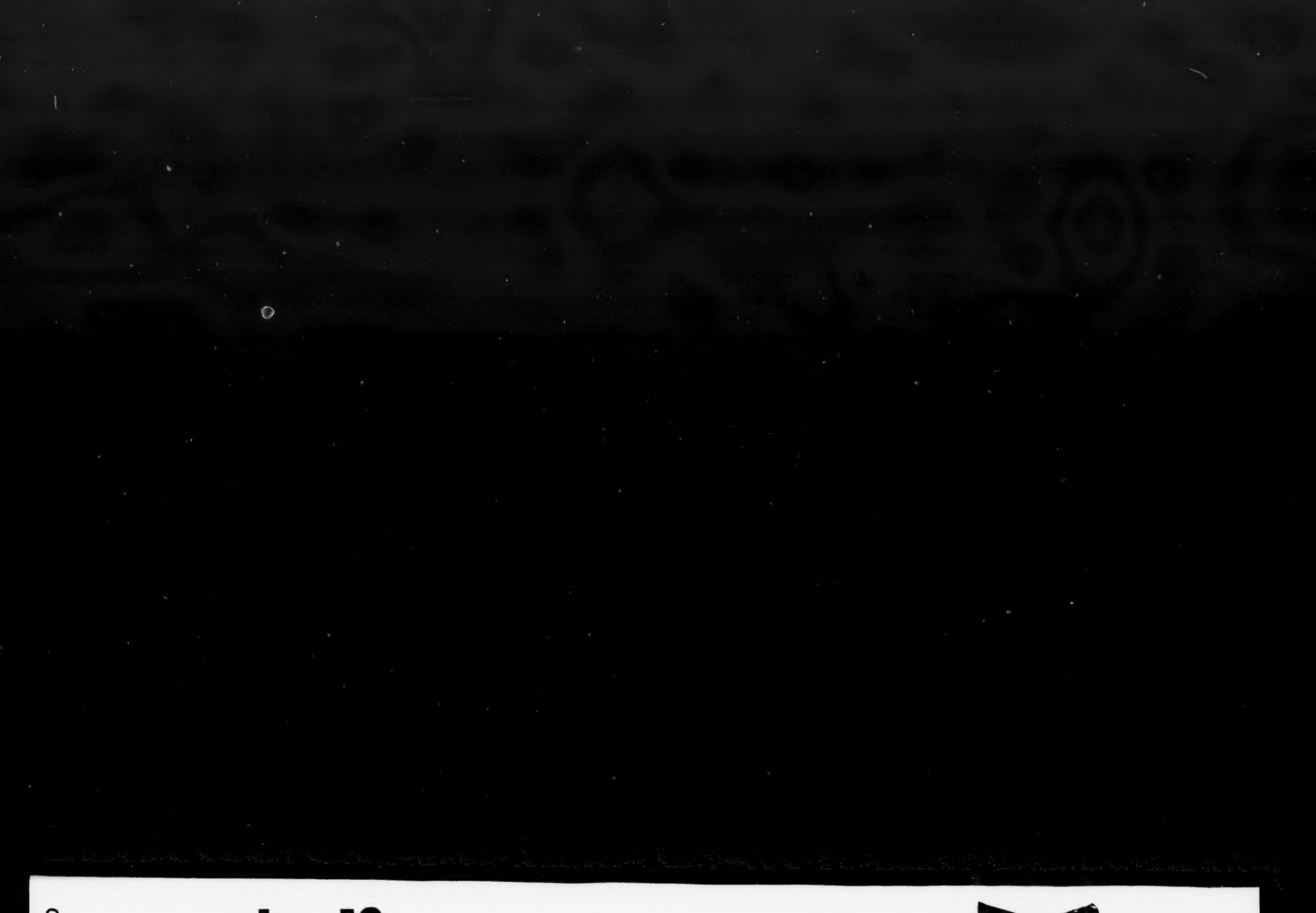

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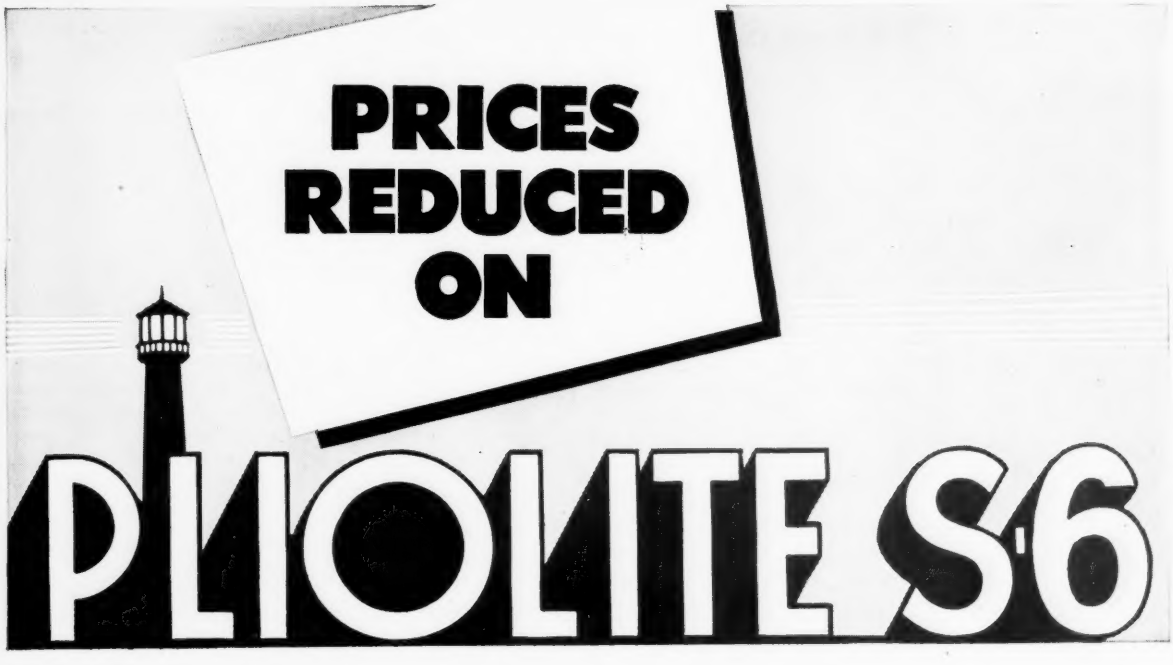

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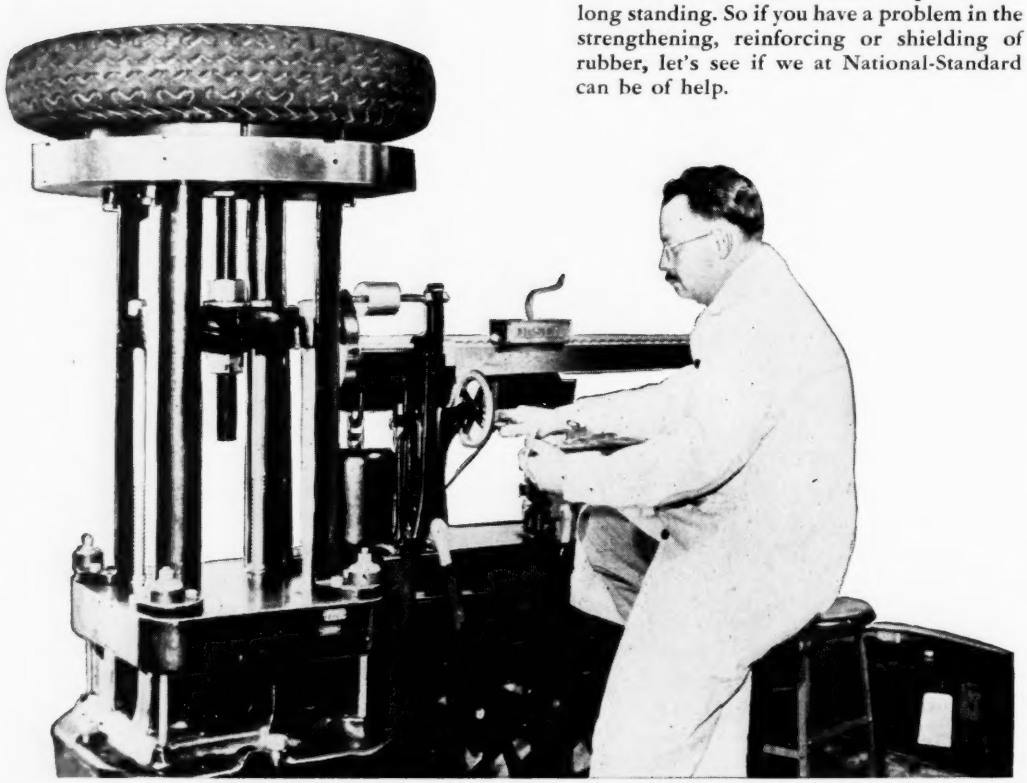
As you may know, whole-hearted cooperation to the full extent of our broad experience, facilities and special skills, with no strings attached, is a National-Standard practice of long standing. So if you have a problem in the strengthening, reinforcing or shielding of rubber, let's see if we at National-Standard can be of help.



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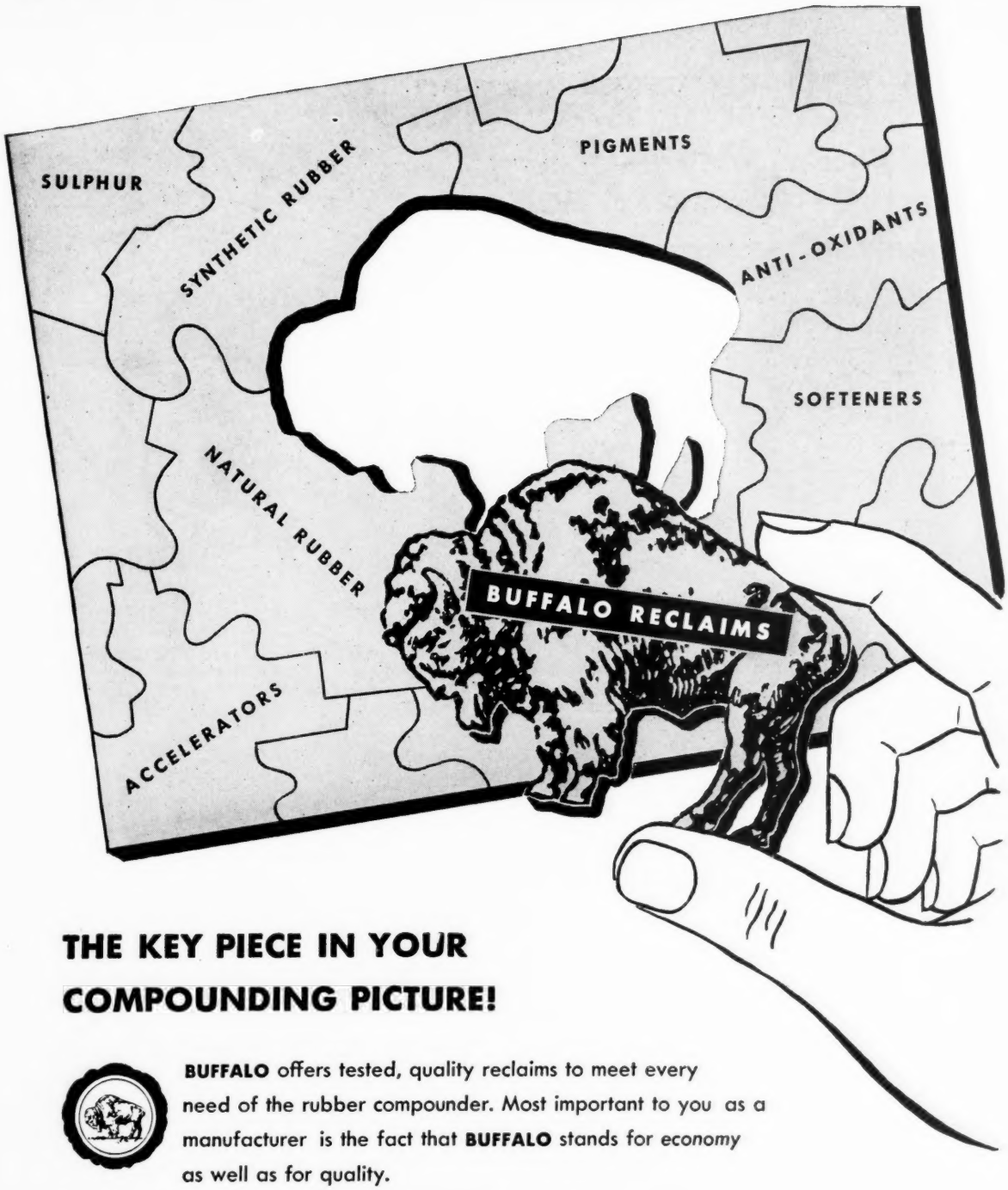

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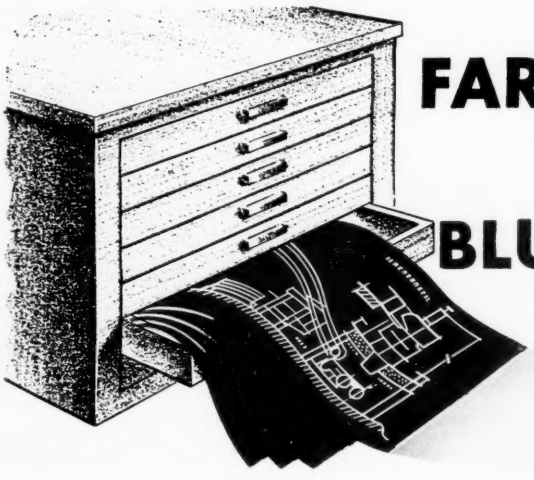

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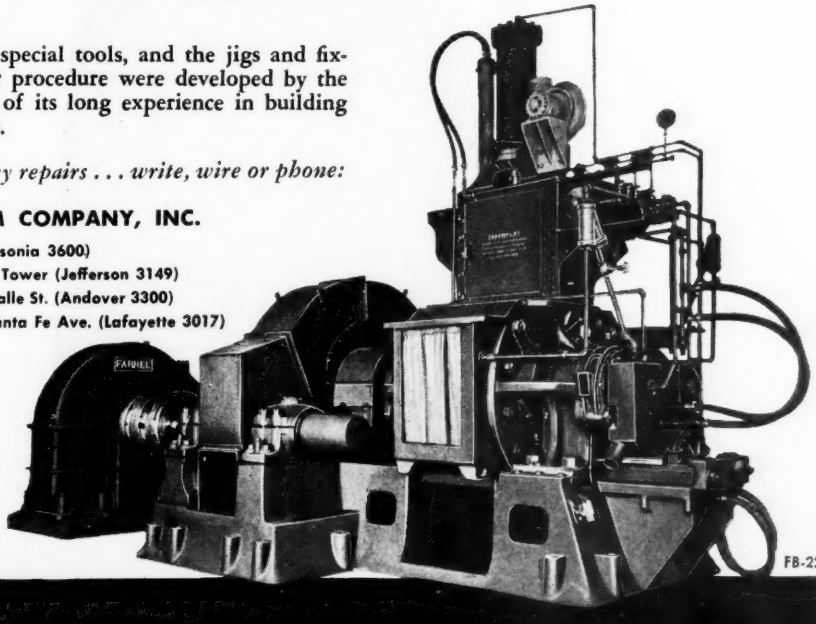

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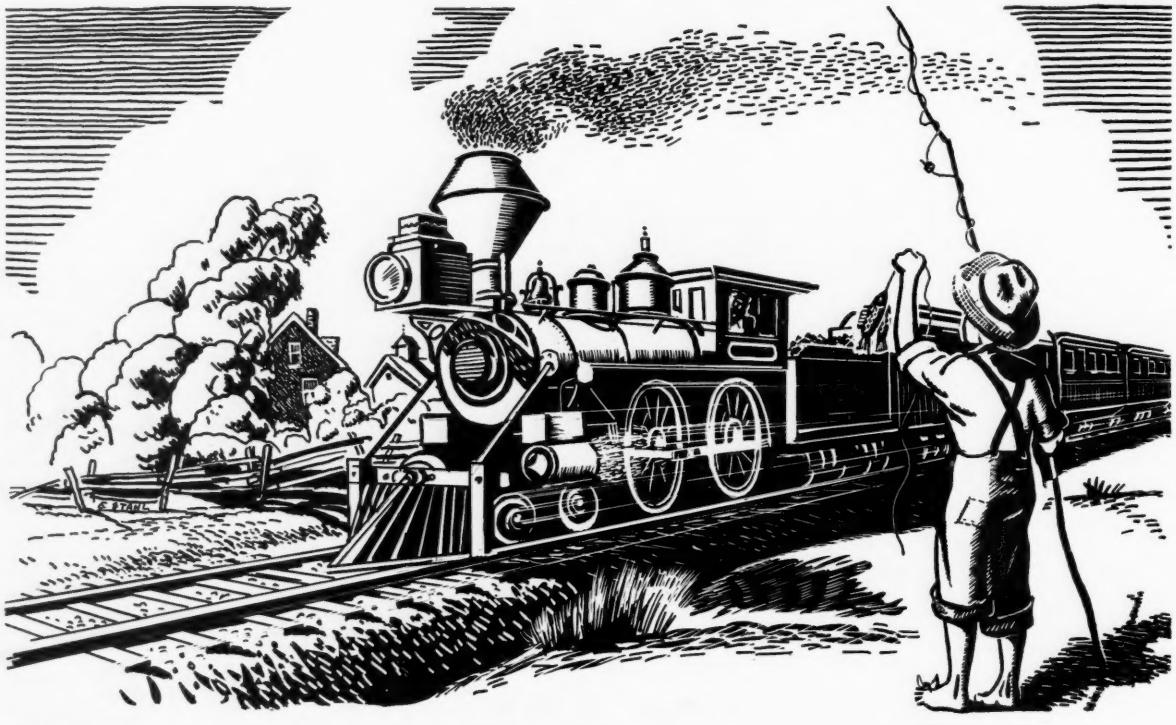

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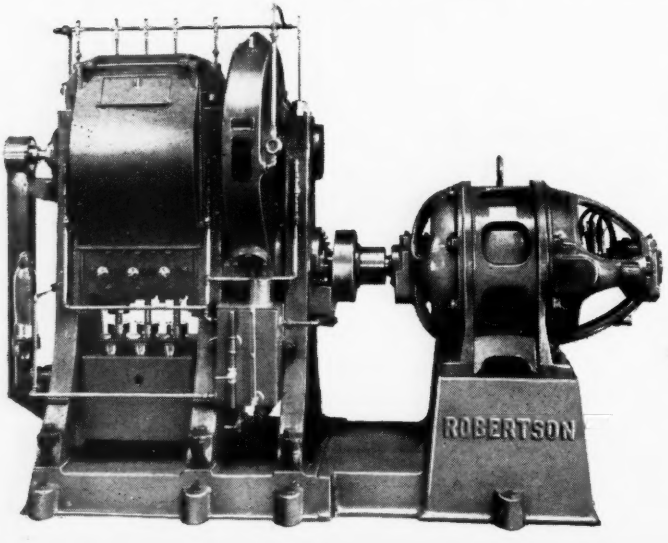
Robertson had already pioneered and attained leadership in the design and manufacture of high-pressure hydraulic equipment. More than four generations of *specialized engineering* and manufacturing experience and craftsmanship have only served to consolidate that superior position.



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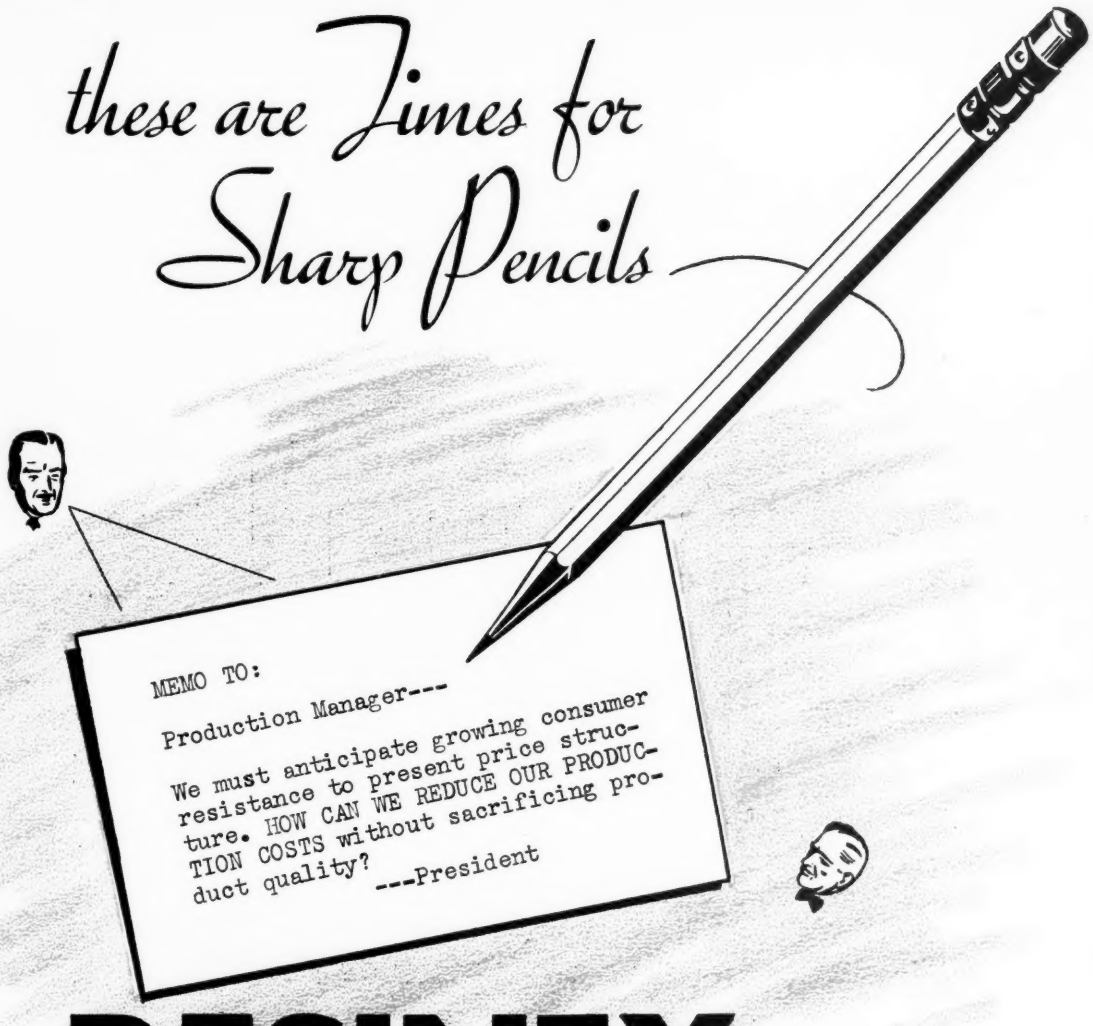
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A *NEW* WHITE
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WHITETEX

● Can be used in pastel colors of rubber, synthetic rubber and plastics, especially vinyls.

ALSO... as an extender for Titanium Pigments, Lithopone, Zinc Oxide.

WHITETEX has a G. E. brightness of 90-92 and very good visual color.

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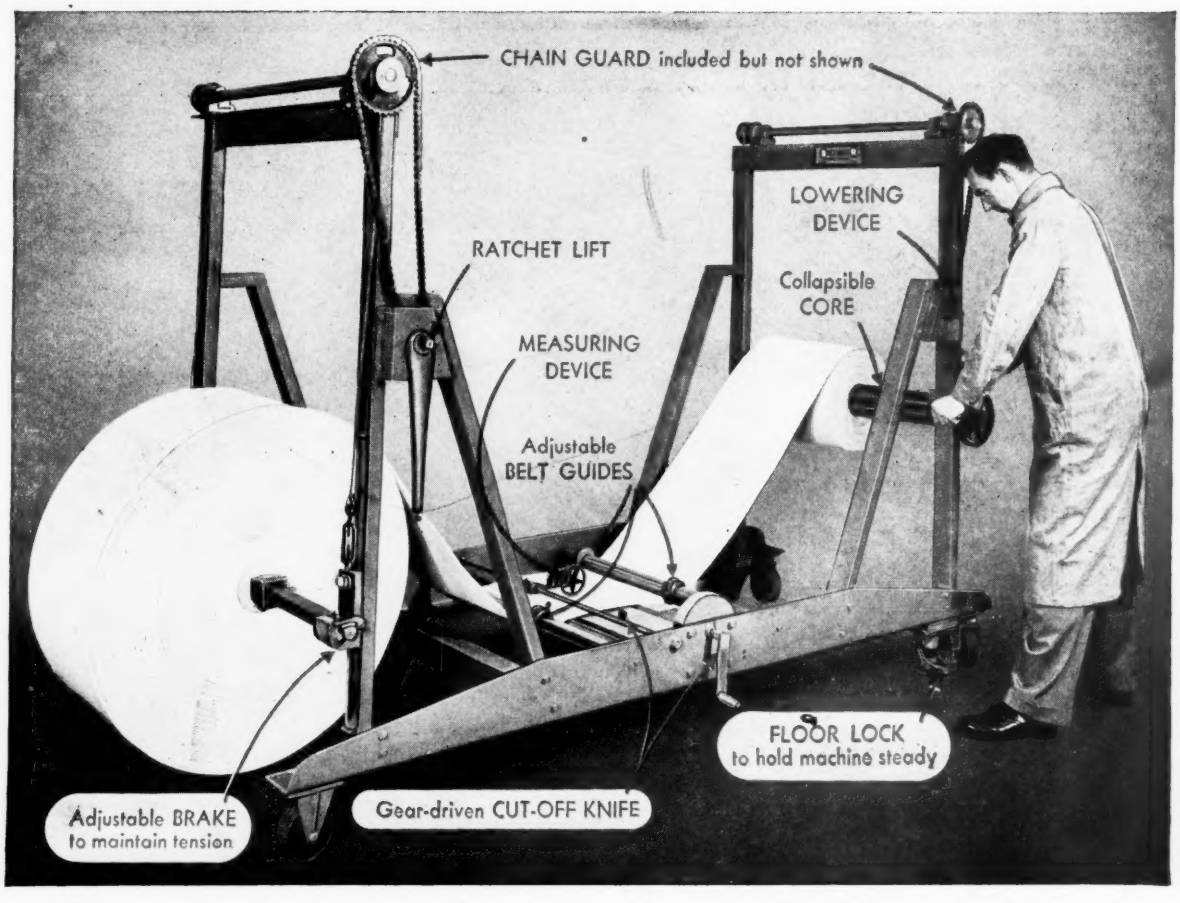


CUT YOUR COSTS

of LABOR – Warehouse SPACE – WASTE of Belting

Wherever belts are warehoused and sold — in a manufacturer's shipping department — in every factory branch — in a distributor's warehouse — BELTMASTER soon pays for itself, pays EXTRA profits year after year.

Under today's conditions — with space and labor both costly — and space shortage a vitally important problem—BELTMASTER earns large savings. In other words, it costs you real money every month, to do without BELTMASTER.

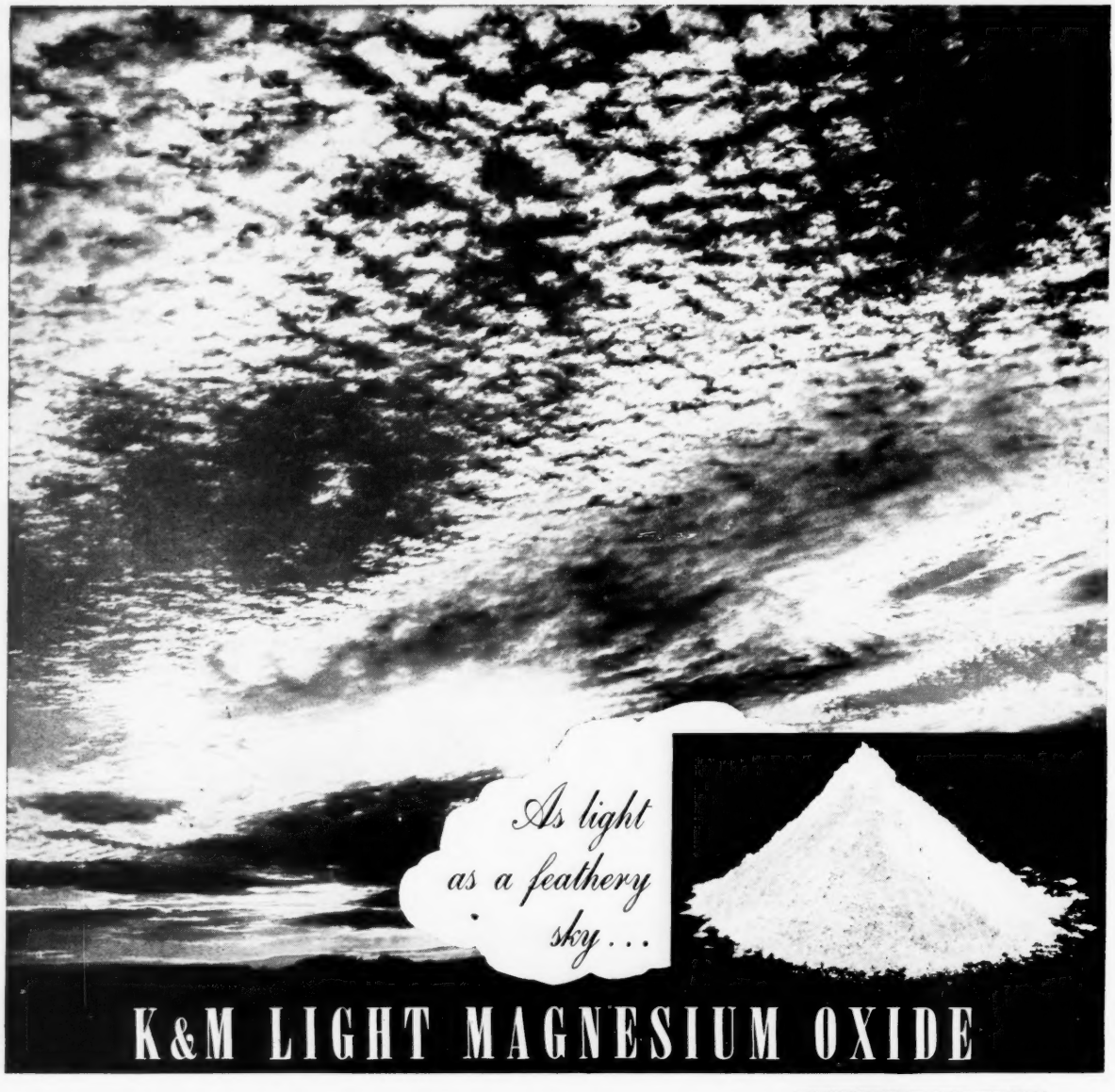
1. **It's PORTABLE** — rolls easily to where belting is stored.
2. **It's COMPACT** — operates in a space of only 12 by 12 feet.
3. **LIFTS BELT** — lifts full roll up and mounts it ready to unroll and measure. Capacity 2,000 lbs. — clearance 62 inches.
4. **MEASURES BELT EXACTLY** — one man threads belt through measuring unit — sets guides. Measurement is automatic and exact.
5. **CUTS BELT SQUARE** — both ways. Powerful clamp holds belt tight for cutting. BELTMASTER gear-driven knife cuts belt square and smooth, both as to width and edge.
6. **ROLLS MEASURED BELT** — patented collapsible core winds up measured belt without slipping — brake prevents loosening or creeping. Belt rolled ready to ship.
7. **LOWERS CUT-OFF BELT** — tight, true roll of belt is ready to fasten, wrap and ship. Collapsible core easily released and removed.
8. **BELTING RETURNED TO STOCK** — BELTMASTER delivers unused portion of full roll back to stock.
9. **SLITTING ATTACHMENT** — a special accessory — available at reasonable cost — which equips BELTMASTER to slit slab stock to any width required. Slits and rolls up belting easily, quickly, square and true.

Wire or write for prices — delivery time — further particulars

RALPHS - PUGH COMPANY, INC.
530 Howard Street · San Francisco 5, Calif.

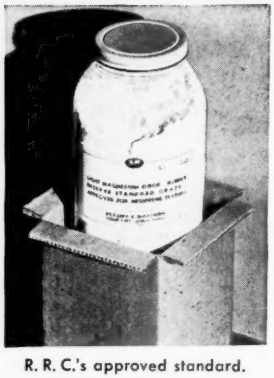
BELTMASTER®

TRADE MARK
PATENTS PENDING



The exacting requirements of Neoprene Compounders call for Magnesium Oxide that is uniformly light and unvarying in quality. K&M Light Magnesium Oxide provides the surest answer to these needs because: (1) it is manufactured by America's oldest and most experienced makers of magnesia products; (2) it undergoes careful laboratory control from the raw material stage to finished product: (3) it is furnished in *one*, and only one grade—the highest quality obtainable.

Large supplies are available. Prompt warehouse delivery.



R. R. C.'s approved standard.

KEASBEY & MATTISON
COMPANY, AMBLER, PENNSYLVANIA

OUR DISTRIBUTOR FOR K&M LIGHT MAGNESIUM OXIDE IS:

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Are you converting your mechanical goods compounds to natural rubber?

INDONEX plasticizers

will help you keep volume costs down while obtaining desired quality.

The four compounds tabulated below illustrate quality obtainable using high loadings of carbon black, with INDONEX for smooth processing, good aging, etc.

For various products these formulations can be cheapened by partial replacement of carbon black with low cost fillers.

Smoked Sheets	100	100	100	100
EPC Black	35	100	—	—
SRF Black	25	—	125	—
MT Black	25	—	—	—
HMF Black	—	—	—	100
Zinc Oxide	5	5	5	5
Stearic Acid	1	1	1	1
INDONEX 639½	20	35	35	35
Sulfur	3	3	3	3
Benzothiazyl Disulfide	1	1	1	1
BLE Powder	1	1	1	1
	216	246	271	246
Sp. Gr.	1.23	1.21	1.25	1.20
Original Tests*				
Modulus, 200%	731	420	800	1115
Tensile, psi	1922	1910	1630	1590
Elongation, %	466	600	448	300
Hardness	59	56	58	61
Tear, lbs.	382	315	285	199
Comp. Set (30%-ASTM "B") (22 hrs. at 158°)	32	44	24	28
Oven Aged, 70 Hrs. at 212°F.*				
Modulus, 200%	1460	1000	1310	—
Tensile, psi	1685	1182	1424	1232
Elongation, %	250	250	225	169
Hardness	74	74	68	72
Tear, lbs.	226	239	290	156

*Avg. of 6 or 8 cures at 316°F. except Comp. Set which is on 25 min. cure

INDOIL
CHEMICAL PRODUCTS

Don't reconvert by merely going back to prewar formulas. Let INDONEX help you to lower volume costs while retaining desired quality.

STANDARD OIL COMPANY (INDIANA)
CHEMICAL PRODUCTS DEPT.
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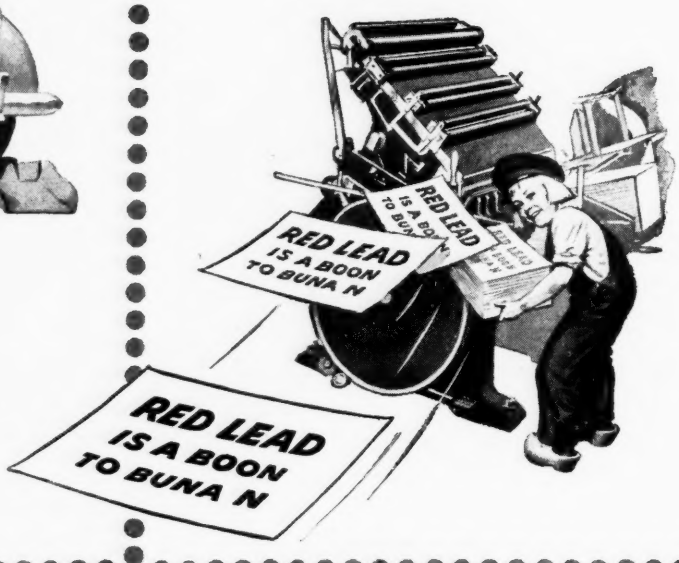
From Oil-Proof Soles to Printers' Rolls



Dutch Boy: "Yes Sir . . . Red Lead is a boon to buna N products."

Plant Chemist: "But just what does it do?"

Dutch Boy: "Briefly, it gives you definitely improved properties at lower cost."

Plant Chemist: "Can you back up that statement?"

Dutch Boy: "Absolutely! Exhaustive tests, fully confirmed by the experience of users, prove beyond any question, that compounding buna N with #2 RM Red Lead gives the five, very real advantages we've listed at the right."

Plant Chemist: "Very interesting! Where can I get further information?"

Dutch Boy: "Just let us know your specific application and our technical staff will gladly supply literature and any other information you need. Drop a line to the Rubber Division of our Research Laboratories, 105 York Street, Brooklyn 1, New York."

Plant Chemist: "One more question. Is buna N the *only* rubber Red Lead improves?"

Dutch Boy: "By no means. Red Lead improves most rubber products, no matter whether your base is GR-S, GR-S-10, GR-M or GR-I. Just remember, if it's made with rubber it's better made with Red Lead."

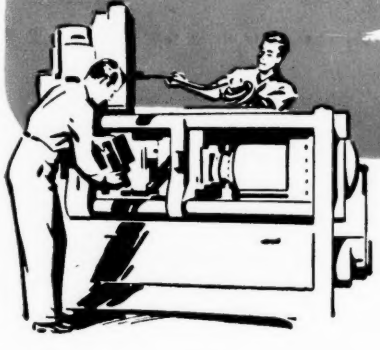
CHECK THESE 5 REASONS FOR COMPOUNDING BUNA N WITH #2 RM RUBBER RED LEAD

1. *Greatly Improved Heat Stability*
   - *a) Retention of modulus*
   - *b) Retention of elongation*
   - *c) Retention of hardness*
2. *Decreased Cost*
3. *Improved Water Resistance*
4. *Excellent General Physical Properties*
5. *Safe Processing*

NATIONAL LEAD COMPANY—New York 6; Buffalo 3; Chicago 8; Cincinnati 3; Cleveland 13; St. Louis 1; San Francisco 10; Boston 6, (National Lead Co. of Mass.); Philadelphia 7, (John T. Lewis & Bros. Co.); Pittsburgh 30, (National Lead Co. of Pa.). Charleston 25, West Virginia, (Evans Lead Division).

If it's made with buna N ... it's better made with **RUBBER RED LEAD**

RELEASE MOLDED RUBBER *Economically*



USE COLITE CONCENTRATE... *A High Quality Concentrated Liquid Mold and Mandrel Lubricant*

- Results in a shiny, satin-like finish.
- Never builds up on the molds.
- Is extremely *economical.*
- Is non-toxic, non-tacky, odorless.

Write today for further information on the Colite Concentrate way of removing cured rubber and plastics from molds

For brighter white goods, Colite D43D is recommended.

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Tread sections vary less than 1/8"

when cut on the new

NRM TREAD SKIVER

WHY *recut* your tread sections! With the new NRM Tread Skiver you get *precision* cutting—with less than ⅛ of an inch variation in length of tread sections.

The big 20″ blade cuts smoothly, precisely, on the fly *in one direction only.* This clean, steep-angle cut of each skive assures perfect matching and a greater surface for vulcanizing, and can be varied in pitch from 15° to 45°.

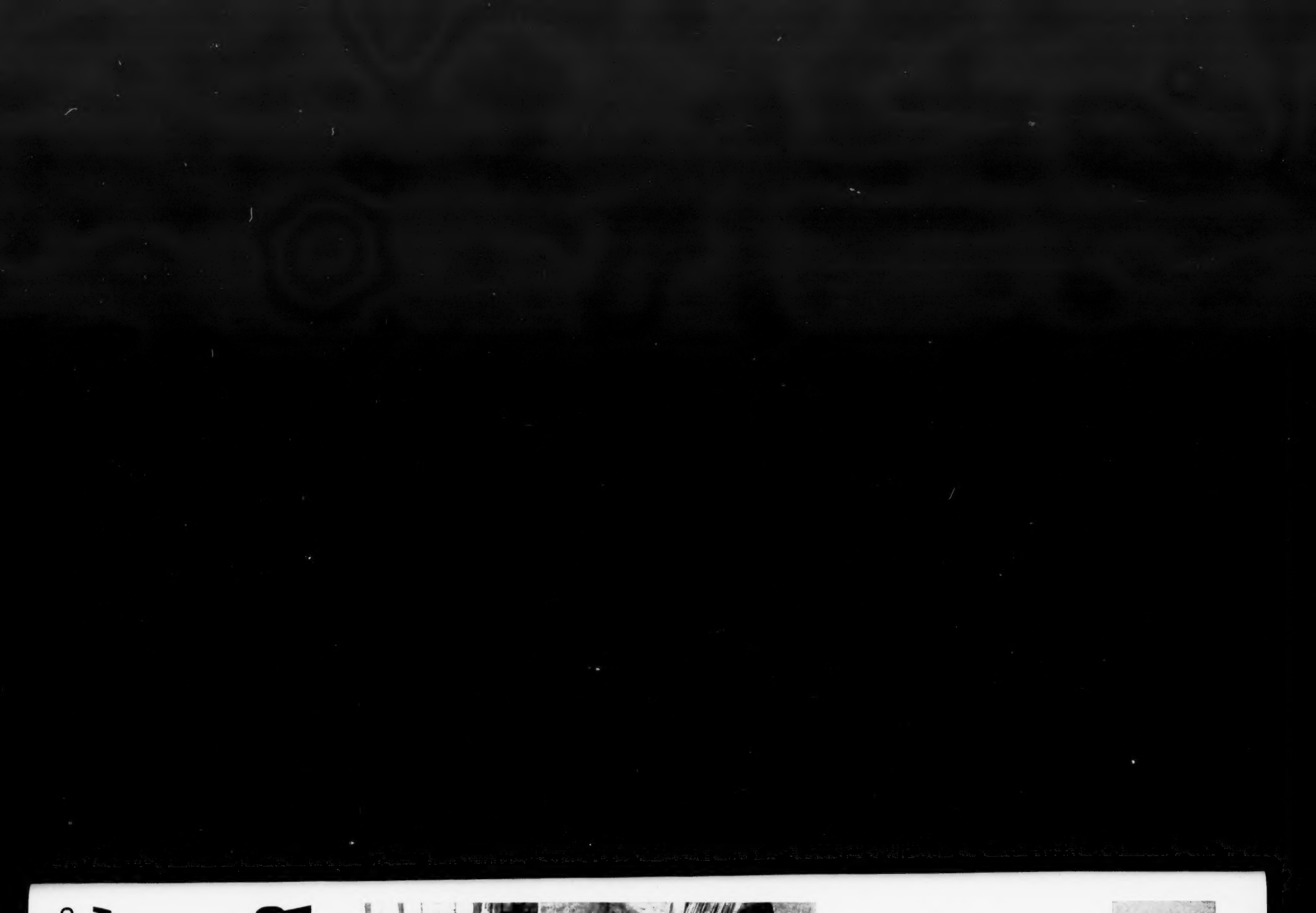
The cutter carriage starts slowly as the blade cuts through the thinner section of the tread, gathers speed through the thicker center, then diminishes speed again at the other thinner edge.

For a complete technical description of the new NRM Model 46 Tread Skivers for 24″ or 36″ belt width, and records of performance in actual production, write to us today.

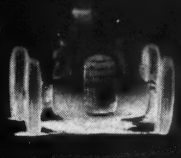
NATIONAL RUBBER MACHINERY CO.

General Offices: AKRON 8, OHIO

Creative Engineering



Coming right at you!



CONTINEX FF

. . . a brand-new, finely divided furnace black which can be substituted for equivalent amounts of channel black. Continex FF approaches channel black in particle size and retains the resistance to abrasive wear so necessary for many end-uses, especially tires.

Samples of this newly developed black are now available, on request, for evaluation by your technical staff.

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LOS ANGELES • BOSTON • CHICAGO
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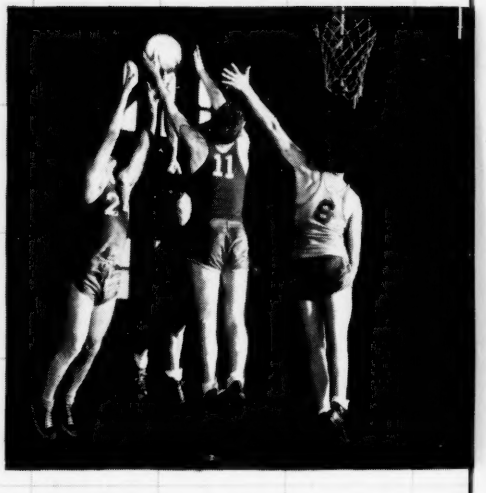
Specially ENGINEERED *for specific* END RESULTS



Continental's complete line of furnace and channel Carbon Blacks is specially engineered to give specific and outstanding properties to various types of rubber end products.

Such products range from footwear to mechanical goods ...from motor mountings to wire and cable jackets... from belting to bus, truck, racing and pleasure-car tires.

Look through the brief descriptions below. One or more of these specially engineered Carbon Blacks may help *your* product do its work better, stay on the job longer.

CONTINENTAL CARBON BLACKS

CONTINENTAL F... hard processing channel black with average particle diameter of 20 to 25 m mu. Available either compressed or in pelletized form.

CONTINENTAL A... medium processing channel black having 25 to 30 m mu average particle diameter. Produced as pellets or compressed.

CONTINENTAL AA... easy processing channel black with average particle diameter of 30 to 33 m mu. Available either in compressed or pelletized form.

CONTINEX FF... a new furnace black having a particle size more closely approaching the range of the channel blacks than any previous furnace black.

CONTINEX HMF... high modulus furnace process carbon black with an average particle size range of from 30 to 60 m mu. Especially effective in GR-S. Manufactured compressed or as pellets.

CONTINEX SRF... a semi-reinforcing furnace black with average particle diameter of 70 to 90 m mu. Compressed or pelletized.

Write for Samples and Full Technical Data

CONTINENTAL CARBON COMPANY *MANUFACTURER*

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WITCO CHEMICAL COMPANY *DISTRIBUTOR AND EXPORTER*

CONTINENTAL CHANNEL AND FURNACE BLACKS

295 MADISON AVENUE, NEW YORK 17, N. Y.

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Compounders prefer Monsanto's Santoflex B because it does such an excellent job of protecting rubber stocks against both oxidation and flex cracking. Its application is almost universal — tires, tubes, hose, heels, soles, belts and many kinds of mechanical goods.

Plant men also like the way Santoflex B melts and flows into the rubber stocks to give a uniform dispersion at milling temperatures.

For further information on this superior antioxidant, write to MONSANTO CHEMICAL COMPANY, Rubber Service Department, Second National Building, Akron 8, Ohio.

Santoflex B: Reg. U. S. Pat. Off.

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CHEMICALS AND PLASTICS

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Straight to the Point . . .

Banbury Users in ever increasing numbers are learning that Interstate service dependably meets the need for skillful repairing, rebuilding and hard-surfacing . . . Interstate is an organization of experts who have specialized in their work on Banburys for the Rubber Industry. Through their craftsmanship hundreds of these mixers, from the smallest to the largest, have been maintained or restored to maximum efficiency.

Our Service SAVES YOU Time, Trouble, And Money

1. Correct contours restored to worn rotors. **2.** Rotors and mixing chamber made amazingly resistant to abrasion by our exclusive hard-surfacing process. **3.** Worn rings replaced by our own specially fabricated rings. **4.** New bearings, new oil tubes, packing, etc. **5.** Every job has the benefit of our more than a dozen years of specialized experince on this work.

For Quick Estimates on repairing or rebuilding YOUR worn Banburys just write, wire, or phone.

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EXCLUSIVE SPECIALISTS IN BANBURY MIXER REBUILDING

DOUBLE-CHECKED ✓ CHEMICALS FOR THE RUBBER INDUSTRY

TETRAMETHYLTHIURAM DISULFIDE

GRADES:

SHARPLES ACCELERATOR 52-0
is untreated.

SHARPLES ACCELERATOR 52-1
is coated with 2% mineral oil to reduce dusting and improve dispersability in mill mixed stocks.

SHARPLES ACCELERATOR 52-2
is coated with 1% mineral oil and 4% stearic acid to further reduce dusting and to improve dispersability in mill mixed stocks.

USES:

AS A:

VULCANIZING AGENT
PRIMARY ACCELERATOR
SECONDARY ACCELERATOR
RETARDER FOR NEOPRENE

IN:

WIRE STOCKS
SPONGE RUBBER
TIRES
INNER TUBES
MECHANICAL GOODS
HEAT RESISTANT STOCKS
NON-TARNISHING STOCKS

WITH:

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Helps make diaphragms that STAY PUT...

Hose that STAYS FLEXIBLE

S/V SOVALOIDS Improve Buna N Processing, Resist Solvent Extraction

MILLS now processing Buna N, for both molded and extruded goods, can count on S/V Sovaloids as efficient plasticizers of the true solvent type.

Thoroughly compatible with Buna N, these versatile plasticizers are highly resistant to chemical and solvent action. Hence they are ideal plasticizers for Buna N to be used in gaskets, couplings, diaphragms and other articles of this type.

The Sovaloids also assure flexibility at *very* low temperatures. They are naturals for plasticizing Buna N for use in hose and other articles likely to be exposed to cold weather. They cut down processing time and heat build-up on the rolls, and have excellent wetting properties to aid dispersion of fillers and other materials.

Ask your Socony-Vacuum Representative for full details and assistance on applications to your needs.

SOCONY-VACUUM OIL CO., INC., 26 B'way, New York 4, N. Y., and Affiliates: Magnolia Petroleum Co., General Petroleum Corp.

What's New in Petroleum for Rubber?

GR-N Plasticizer... S/V Sovaloid C*, fully compatible with all types of GR-N.

Neoprene Softeners... S/V Sovaloid N, no "blooming"—true softener type.

GR-S Plasticizers... S/V Sovaloids H&W plasticize GR-S, process durable compounds.

Low Temperature Flexibility... S/V Sovaloid L retards stiffening of Neoprene.

Sponge Rubber... Special emulsions assist manufacture of Neoprene sponge.

Sun-Check Wax... S/V Petrosene C* prevents surface cracking.

*Temporarily short in supply.

Process Products

SOCONY-VACUUM

Socony-Vacuum Process Products

Technical Bulletin No. 35 — on the Compounding of GR-S with Substantial Loadings of ZINC OXIDE

XP-36C (Monochlorostyrene Polymer) with 100 Parts of Zinc Oxide

XP-36C is defined by *Office of Rubber Reserve* as follows: *71 butadiene—29 monochlorostyrene, fatty acid soap emulsification, salt acid coagulation, 62 Mooney, PBNA Stabilizer.*

COMPOUND NO. 35	
Polymer	100.0
Sulfur	3.5
MBTS	1.0
DPG	0.1
Coumarone-indene Resin	7.5
E.L.C. Magnesia	5.0
ZINC OXIDE	100.0

ORIGINAL RESULTS

Time of Cure Min. at 45 Lb.	Tensile Strength (psi)	Per Cent Elongation	Modulus Load (psi) for Elongation of: 200%	300%	400%	500%	Permanent Set	Shore Hardness	Tear Resistance Tested at: Room Temp.	100°C.
GR-S										
7.5	40	1435	40	40	40	40	1.56	30	13	5
15	1980	770	190	230	305	455	.33	46	50	33
30	2040	650	235	275	430	705	.36	50	50	33
45	1190	560	200	315	435	750	.23	51	53	35
60	1230	560	240	315	475	790	.25	52	50	33
90	1570	580	235	315	470	860	.28	52	53	35
XP-36C										
7.5	1780	800	160	240	275	395	.31	47	53	35
15	2500	720	240	275	435	750	.42	52	62	38
30	1800	605	240	360	520	920	.33	53	60	35
45	1560	580	240	360	560	1000	.30	54	59	35
60	1700	575	275	395	595	1150	.30	54	59	35
90	1530	550	275	430	665	1255	.27	54	57	35

Time of Cure Min. at 45 Lb.	Goodyear-Healey Pendulum: Indentation in mm.	Per Cent Rebound	Hardness: Shore	Rex	Compression Fatigue (Goodrich Flexometer)*: Per Cent Initial Comp.	Running Time and Per Cent Permanent Set	Max. Temp. Rise °C.	Dynamic Compression: Initial	Final	Cut-Growth Resistance Tested at 70° C. Inches Failure: 400 Cycles	1600 Cycles
GR-S											
60	7.90	63.8	50	53	27.2	82'-35.8	85.4 (At 15'-27.5)	18.9	43.5	.45	.73
XP-36C											
60	7.66	64.4	53	56	24.3	35'-17.3	39.0 (At 15'-30.5)	15.1	28.3	.25	.75

* Test Conditions: 143 Lb. Load. 0.175" Stroke. 100° C. Oven Temp.

RESULTS with the dichlorostyrene polymer—XP-8 in Zinc Oxide compounds were reported in *Technical Bulletin No. 32*, in comparison with Standard GR-S. XP-8 gave the highest all-round physical properties with Zinc Oxide of any of the experimental polymers reported to date. Since monochlorostyrene may be more readily available and at lower cost than dichlorostyrene, XP-36C polymer was prepared for evaluation.

While the tensile and tear results with XP-36C are somewhat lower than XP-8 (Technical Bulletin No. 32), the results are generally better than Standard GR-S and the other modifications. The rebound for XP-36C is higher than XP-8 but the compound shows more compression fatigue.

HORSE HEAD PRODUCTS New Jersey zinc

THE NEW JERSEY ZINC COMPANY
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Products Distributed by THE NEW JERSEY ZINC SALES COMPANY
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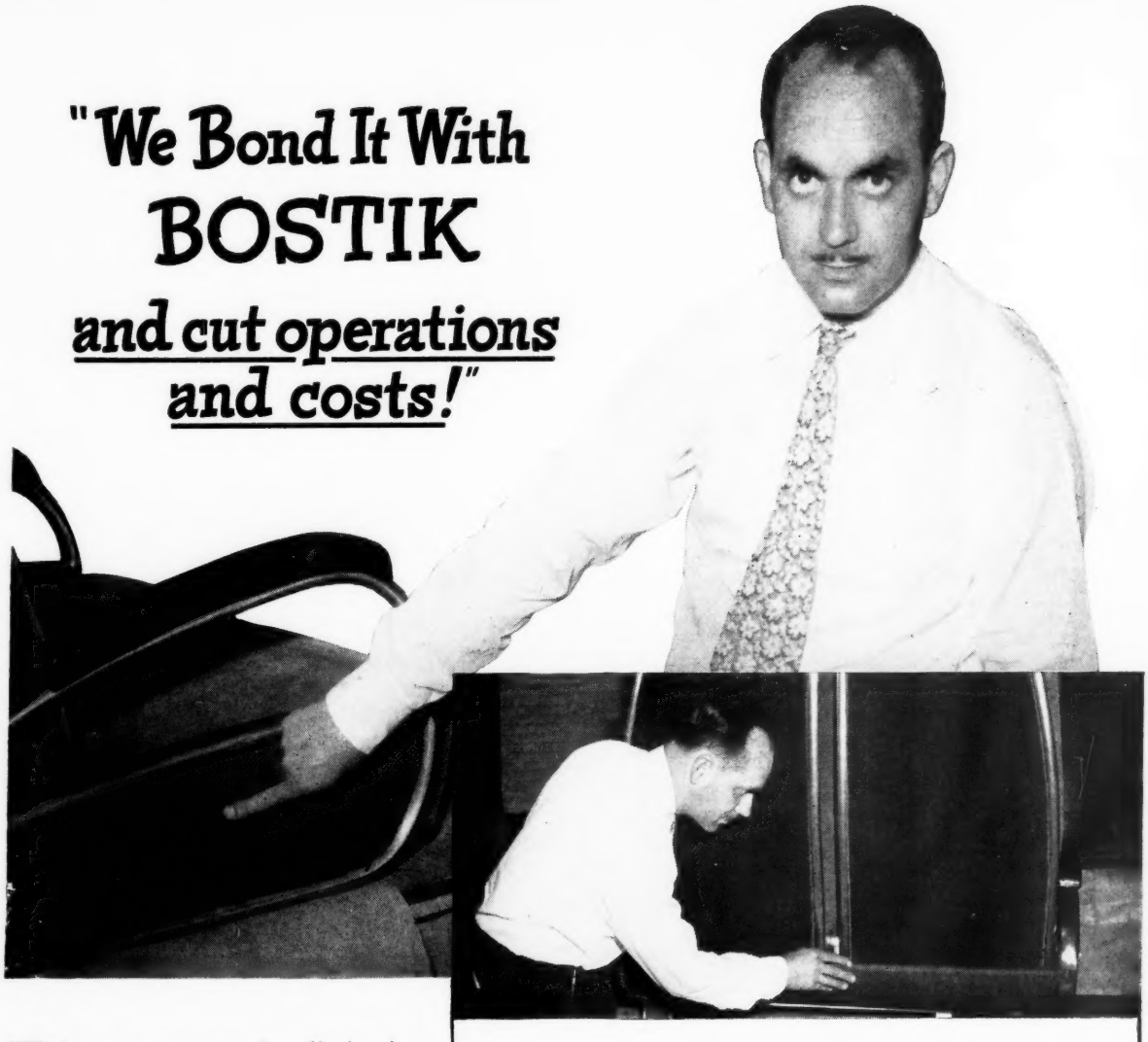
"We Bond It With BOSTIK and cut operations and costs!"



Pointing out toe guard bonded with Bostik, Mr. Radigan states: "Bostik really speeds up the job — does it better at lower cost. We spray it on, instead of brushing it on as with former adhesives. We can apply it over any type of surface, something we could not do before. Moreover, Bostik can stand overnight and be used the next day without appreciable loss in its positive adhering qualities. This amounts to a substantial saving over old types."

"We've cut our costs by eliminating operations and adhesive waste since swinging over to Bostik *Customized* Adhesives," says Mr. Paul Radigan, Assistant Superintendent of Transportation Seating, Heywood-Wakefield Company.

This large Gardner, Massachusetts, furniture company bonds fabric-reinforced vinyl plastic to steel with Bostik, in the manufacture of armrest panels and toe guards for railway coach seats.

"When adhesives we formerly used for this work failed to stand the 'gaff,' we learned about Bostik — and we've used it with great success ever since."

Whatever combination of materials *you* wish to bond, there is a Bostik *Customized* Adhesive that will do the job . . . will bond any material to any material, in any combination.

Write us — *today!*

B B CHEMICAL COMPANY, CAMBRIDGE, MASS.

"Whatever It Is BOND IT WITH BOSTIK"

Stabilizer SN

for HEAT-STABILITY of Vinyl Resins

A new vinyl resin additive offering

- Effective heat stabilization
- Easy handling — fluid consistency
- Transparency with no clouding
- Solubility and compatibility
- Freedom from fire hazard

Use STABILIZER SN

a. in vinyl plastics for high temperature mixing, extrusion, calendering, etc.

b. in vinyl resin films for heat stability in drying or service.

For Samples, Data and Prices communicate with

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—RUBBER SUBSTITUTES—

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Types, grades and blends for every purpose, wherever Vulcanized Vegetable Oils can be used in production of Rubber Goods—be they Synthetic, Natural, or Reclaimed.

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A LONG ESTABLISHED AND PROVEN PRODUCT

THE CARTER BELL MFG. CO.
SINCE
CARTER BELL PRODUCTS
1903
SPRINGFIELD, NEW JERSEY

Fabric Uniformity means Product Uniformity

BECAUSE THE UNIFORMITY of your rubber products can be only as good as the fabric employed, successful production depends, to a large extent, on the uniformity of the fabric used. MT. VERNON fabrics have *that constant uniformity*. Made from choice grades of cotton and woven under rigid laboratory controls, they make for consistent product quality. For better results—specify MT. VERNON fabrics.

uniformity makes the big difference

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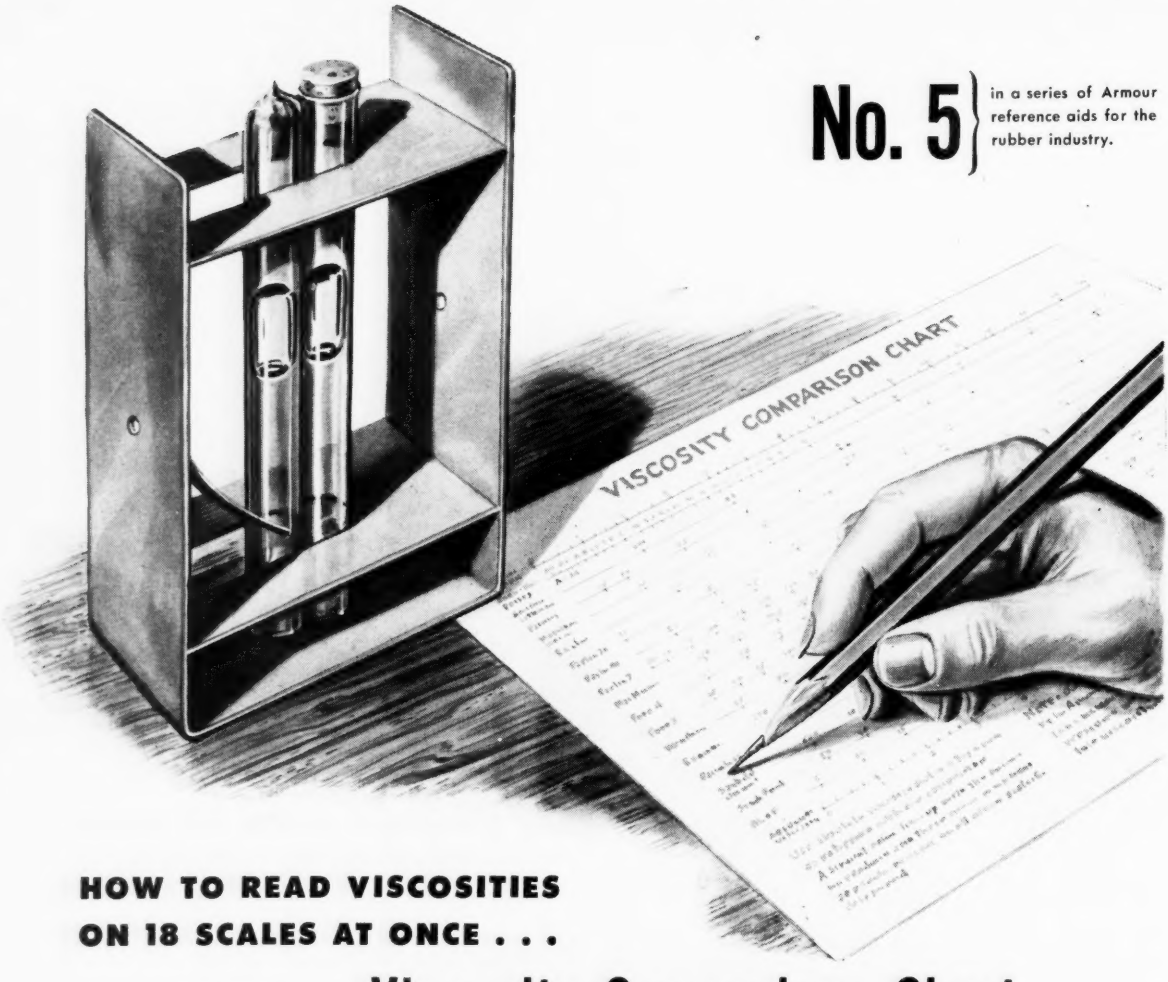

No. 5 in a series of Armour reference aids for the rubber industry.

HOW TO READ VISCOSITIES ON 18 SCALES AT ONCE . . .

USE THIS Viscosity Comparison Chart

All Major Viscosity Scales are shown on this chart, which makes possible the quick and easy comparison of a known reading on one scale with its corresponding reading on any or all of the other seventeen scales.

Available Without Charge, this Viscosity Comparison Chart should be helpful to technical, production and purchasing departments of all firms working with fats and oils. To request your copy, please use the coupon below.

Also at Your Service is a complete line of NEO-FAT fractionally-distilled fatty acids and their derivatives—the amines, amides and nitriles. All are widely used in a variety of chemical processing industries, yet we realize that only a few of the more obvious applications have been fully explored and exploited.

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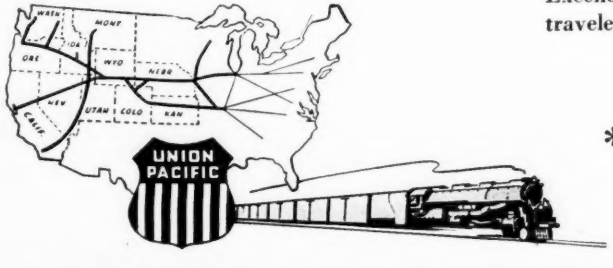

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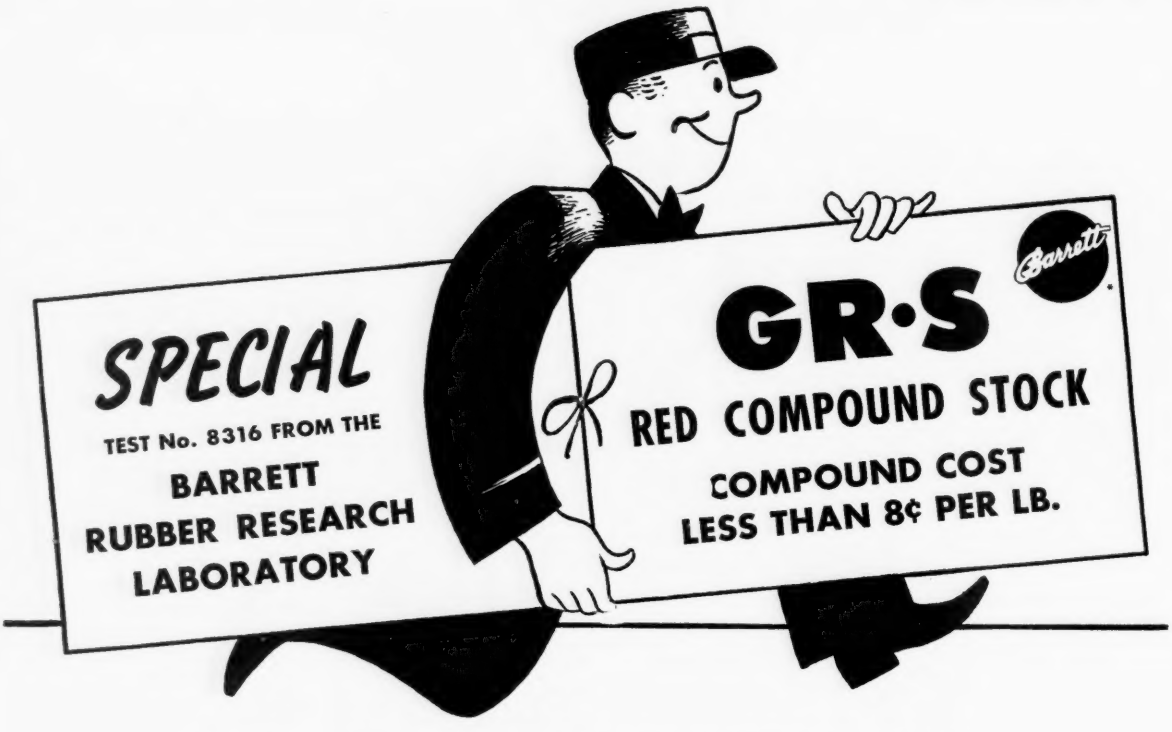

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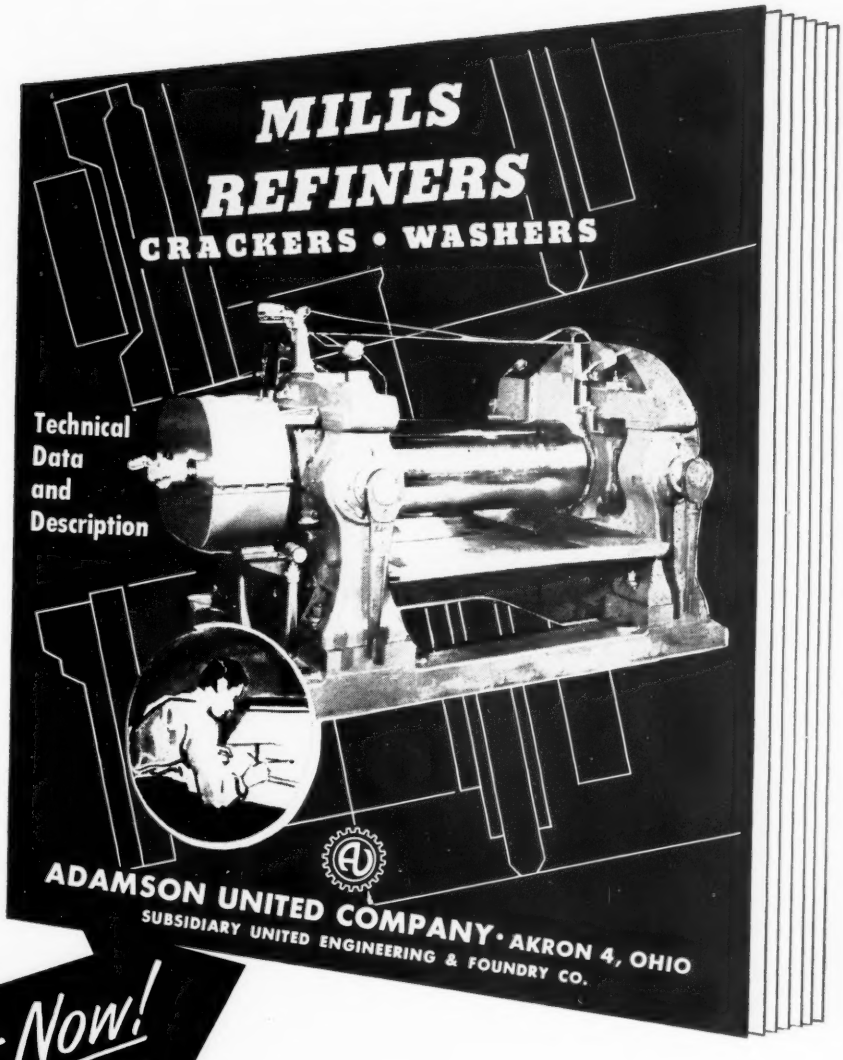

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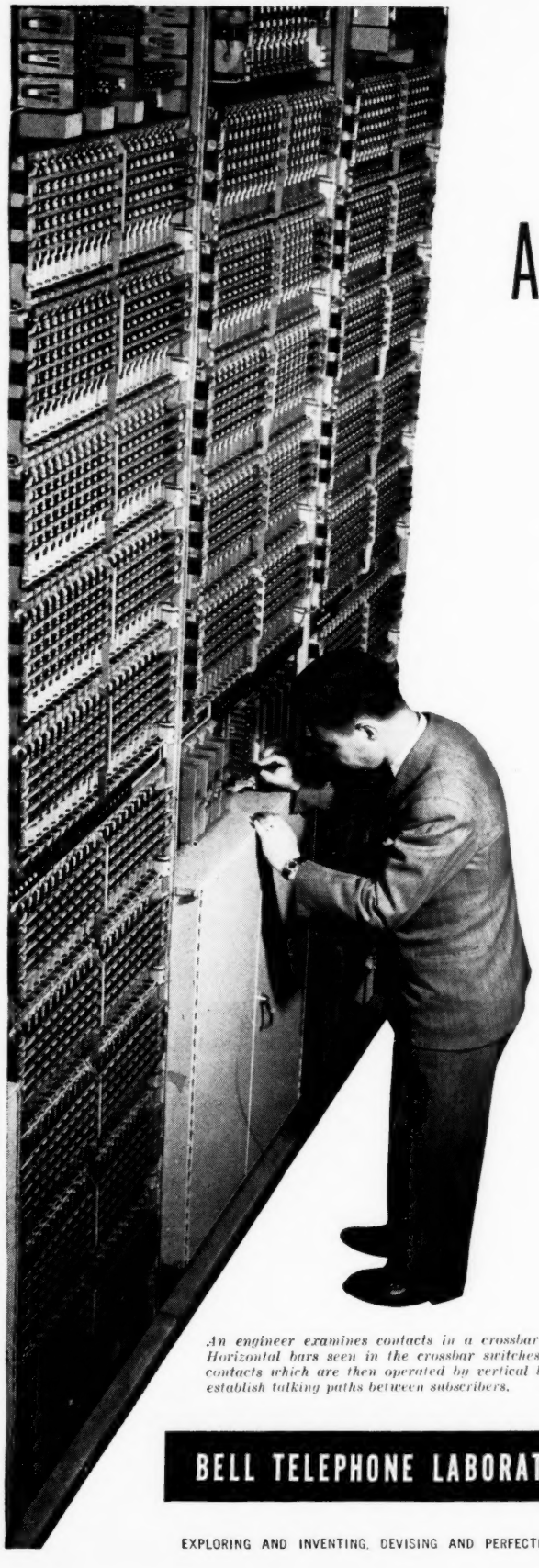

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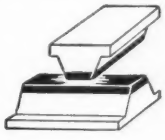

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For the compounding of natural rubber stocks refer to the 1942 Vanderbilt Rubber Handbook.

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NATURAL & SYNTHETIC

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Malayan Rubber Policies—I[1]

P. T. Bauer

THIS article on "Malayan Rubber Policies" by the English economist, P. T. Bauer, is a supplement to his article entitled "The Working of Rubber Regulation," which was published in our January, 1947, issue. In this latter article this author discusses the effects of rubber policies pursued in Malaya over the last 25 years, with special reference to the result these policies had on the smallholders and the country as a whole. Mr. Bauer spent some time in Malaya during the early part of the present year in connection with the preparation of this article.

A portion of the conclusions reached by this author should provide sufficient recommendation for close study of the entire article:

"The policies pursued in Malaya, and in particular the maintenance of the planting provisions of rubber regulation, threaten not only to destroy the competitive strength of the Malayan economy and to eliminate the smallholder from rubber production, but also tend to undermine the social stability of the country. This is an excessive price to pay for the continued protection of the high-cost producers."

A RECENT article in the *Economic Journal* reviewed certain aspects of rubber regulation, notably the treatment of the smallholders. In this paper it is proposed to discuss some implications of the rubber policies pursued in Malaya over the last 25 years or so. The smallholders will be prominent in the discussion, but the effects of these policies on the Malayan economy as a whole are also considered. The principal topics reviewed are the cost to smallholders of their under-assessment under the Stevenson Restriction Scheme, 1922-28, and the International Rubber Regulation Scheme, 1934-42; the new planting and replanting policies and their effects on the position of the smallholders, as well as on the competitive position of the Malayan rubber industry as a whole; the actual outcome of a small concession on new planting in 1939-40; and the treatment of smallholders by the Rubber Research Institute of Malaya. The writer has recently had the opportunity of visiting the smallholdings districts of Malaya, and some of the information summarized in this article is based on this visit.

Under-Assessment of Smallholders

The loss inflicted on Malayan smallholders through their domestic under-assessment under the I.R.R.S. was estimated in the *Economic Journal* article at over rather than under £10 million, or 85 million Straits dollars. This calculation was based on official acreage, production and export figures, and on the price of export rights. The data were derived, as they necessarily had to be, from aggregate Malayan production and acreage figures. When in Malaya, the writer questioned individual Asiatics on the working of rubber regulation, and particularly on the relative assessment of estates and smallholdings. The purpose of these inquiries was solely to ascertain how far the more alert section of the population had understood the operation of restriction or had appreciated the different treatment of estates and smallholdings. As will be seen, the information gathered tallied closely with the results previously ascertained from published sources. This kind of inquiry could be addressed only to some headmen and rubber dealers, as practically all individual smallholders were ignorant of these matters.

There arose here various complications. First, for restriction purposes, estates were assessed in terms of pounds per acre, while the assessments of smallholdings were expressed in "units" whose value varied slightly from year to year, so that even a literate and intelligent owner could not be expected to know his assessment, much less to remember it after six years. Moreover, most smallholders and even some dealers and headmen found it difficult to grasp the difference between assessments and exportable amounts (which varied, of course, with the rate of release under regulation). They did, however, generally remember whether their own holdings, or others which they knew, had been classed as A, B, C, or D for assessment purposes, and from this information the assessments could generally be deduced.

There was also present an obvious dilemma. It would have been useless bluntly to ask a headman or a rubber dealer what he thought of the relative assessment of estates and smallholdings of equal productivity. As the interrogator was a recently arrived European personally unknown to him, the headman or dealer would have almost certainly replied either that he did not know, or that areas of equal yielding capacity had received equal assessments. These were, in fact, the answers returned on the few occasions when the question was put in this

[1] Reprinted from *Economica*, May, 1947, pp. 81-107.
[2] "The Working of Rubber Regulation," *Economic Journal*, Sept., 1946, p. 391. Reprinted in India RUBBER WORLD, Jan., 1947, p. 501.

simple form. If, on the other hand, the question had been prefaced by an assurance that the man could speak his mind freely, this would have turned the query into a leading question. The following method was therefore devised. Questions on the relative assessment of estates and smallholdings were addressed only to the more alert rubber dealers to whom the writer had a personal letter of introduction, or to the more active headmen whom the accompanying rubber instructor (a junior Asiatic official of the Rubber Research Institute of Malaya) appeared to know well. The men were assured that they could speak freely, but that they should not express an opinion unless they could indicate its basis at least roughly. The question was put to 24 non-Europeans only outside Kuala Lumpur. Eleven individuals answered the question, eight Chinese and three Malays.

They all stated that estates of equal capacity had received higher assessments; when pressed for a quantitative assessment, five said that the difference had been approximatley one *pikul* (133⅓ pounds) per acre. Three thought that the difference had been about one restriction class, i.e., that if a smallholding of a given yielding capacity was classed as C for assessment purposes, an estate of equal productivity would have received an assessment corresponding to a class B assessment for a smallholding; this, incidentally, was roughly equal to one *pikul* an acre, so that these answers were in substance identical, although they were worded quite differently. Two men said that they did not know what had been the difference in assessments, but believed that it had been considerable. The eleventh man said that the difference could not be estimated easily, because the very small, or very poor, holdings had been comparatively leniently treated, and the brunt of under-assessment had been borne by the better holdings. All these men were asked to state the basis of their opinion that the estates had been more favorably treated; in particular how they were able to estimate what had been the estate assessments in their areas. In every instance a rational answer was returned: assessments were known through a relative working in an estate office, or through a friend employed on an estate, or the information had been obtained from a member of the assessment committee, or from planters serving as inspectors, or the assessments could be inferred from rubber sales. The question was intentionally addressed only to persons who were a biased sample, being especially alert and intelligent.

It is of interest to note that if the estimate of a difference of about one *pikul* per acre is accepted, and this figure is applied to the average mature acreage between 1934-40, then on the basis of the average rate of release over this period, and of an up-country value of export rights of about 4d. per pound (the basis of the calculations in the *Economic Journal* article), the loss to the smallholders through under-assessment emerges as about £12 million. This is very close to the original figure of £10 million, which was stated to be conservative.[3]

It is also possible to compute roughly the corresponding loss inflicted on smallholders through under-assessment under the Stevenson Restriction Scheme of 1922-28. During that scheme the total Malayan quota was not divided into two parts for estates and smallholdings, as was done after 1934, but estates and smallholdings were separately assessed on different scales. The average assessment of smallholdings was slightly less than one-half the average assessment of estates; it subsequently transpired that normal yields per acre on smallholdings were substantially higher than on estates. The assessment of fully mature European estates was of the order of 360-400 pounds per mature acre. As the assessment of smallholdings was less than half that of the estates (in spite of the higher productivity of the former), an under-assessment of 180 pounds per mature acre is definitely conservative. The average mature area of Malayan smallholdings during the currency of the Stevenson Scheme was about 750,000 acres. The average rate of release over the six years of the scheme was 67%. During that scheme there was no market in export rights, which were non-transferable, but the value of the right to export rubber can be conservatively estimated at 1/2 per pound. Under the international scheme over the years 1934-40 the London price of rubber averaged 8¼d. per pound, and the average price of export rights up-country was over 4d. per pound. During the currency of the Stevenson Scheme the London price of rubber average 1/7¼ per pound, which was extremely profitable, and it is legitimate to assume an average value of 1/2 per pound for the right to export during the period. Assuming an average value for export rights of 1/2 per pound over the currency of the Stevenson Scheme, an under-assessment of 180 pounds per mature acre, an average mature area for smallholdings 750 000 acres and an average release of 67% the loss through under-assessment emerges at £32 million or 270 million Straits dollars.

Adding this figure to the calculated loss under the 1934 scheme, the total emerges as a sum between £40-45 million, or about 370 million Straits dollars. To get these very large figures into perspective, it should be noted that the total allocation to Malaya under the Colonial Development and Welfare Act is about £5 million, or 43 million Straits dollars, with the purchasing power of money now much less than it was in the 1920's and 1930's.[4]

In Malaya this treatment of the smallholders is fairly widely known. Some alert and educated Chinese told the writer that is was common knowledge among the educated Asiatics throughout Malaya that the smallholders had been greatly under-assessed. It would have been gratifying to be in a position to dispute this opinion, but it could not be challenged. The following extract from a leading article in the *Straits Times* of April 23, 1937, serves to illustrate that these indisputable facts were also widely known.

"It is useless to shut our eyes to the obvious fact that in the present scheme in Malaya the European-owned estate receives preferential treatment in the matter of assessment, particularly where budded trees are concerned, and that the Asiatic is restricted to maximum assessment of 500 pounds, regardless of the possibility of his having the highest yielding trees in the country."

Planting Provisions of Regulation Schemes

The planting provisions of rubber regulation were discussed at some length in the *Economic Journal* article already mentioned. It was pointed out that the prohibition of new planting, coupled with a large amount of replanting, jeopardized the whole future of the smallholdings industry. That article dealt, however, with smallholdings generally, without sub-division by territories. As will be seen shortly, the danger to the Malayan smallholders is much greater than would appear at first sight from the data presented in that article. It is necessary to speak in the present tense, since in Malaya the rubber restriction legislation has not yet been repealed,

[3] At one place in the *Economic Journal* article it was erroneously stated that "smallholders' quotas over the years 1934-41 . . . . . ." The calculation referred to the years 1934-40 only, as is clear from the tables in that article, as well as from the context. If the year 1941 had also been included (for which the data are not so complete), the calculated loss would have been about £2 million (17 million Straits dollars) higher.

[4] These calculations are intended to indicate orders of magnitude only. If assessments had been equal, the price of export rights would have been different from the actual levels, and in strict logic this should be allowed for in computing the loss to smallholders through under-assessment. It is plainly impossible to estimate this quantitatively.

and the planting provisions of rubber restriction are still (February, 1947) enforced. This seems to be inconsistent with the official Colonial Office communiqué of December 29, 1943, on the expiry of the International Rubber Regulation Scheme.

"They (the British, Dutch and Indian Governments) have, for some time past, been considering the possibility of constituting a new and more widely representative committee for consultation and the collection of information. Such a committee should, in their view, have no powers of regulation on export, production or planting."

Formal considerations apart, the continued prohibition of new planting in Malaya raises certain important practical issues.

The area under rubber in Malaya is approximately one-third of the world acreage under rubber. It is obviously most unwise for any territory to embark on a policy of unilateral restriction on the expansion of capacity when it represents only about one-third of the total capacity. It is necessary to examine this policy in its historical setting to appreciate its motives and to assess its probable results.

Complete prohibition, or substantial curtailment, of new planting has been a feature of official policy in Malaya since 1922. During the Stevenson Restriction Scheme from 1922 to 1928 new planting was not prohibited, but it was officially discouraged. With very few exceptions no land for rubber planting was alienated (given out to private persons for planting) in Malaya during the currency of that scheme. Lawful new planting was very largely confined to owners of land already alienated, but not yet planted with rubber. This was either land planted with other crops or unplanted land held in reserve. This policy much restricted the scope of new planting in the 1920's. Estates undertook some new planting on unplanted reserve land which many estates had. Smallholders very rarely have unplanted reserve land, and much of the planting they undertook was on land which had been under other products, chiefly under coconuts or under fruit trees. In view of the present world shortage of vegetable oils and the record price of coconuts and copra it is worth reflecting now on the felling of fruit trees and particularly of coconut palms which results from the official refusal to alienate land for rubber planting. For the sake of completeness it must be recorded that there was also some illicit planting during the Stevenson Scheme, partly on land alienated for purposes other than rubber or on land to which no titles had been issued. But the ban on the alienation of land for rubber planting was a severe check on new planting, particularly on smallholdings; what new planting there was had to be undertaken largely at the cost of destroying another source of income.

After the withdrawal of the scheme, applications for the alienation of land for new planting were entertained for two years only, and the land books were closed again for applications in 1930. But even during these two years administrators in many districts were reluctant to alienate land for rubber planting, particularly to smallholders. From 1930 to 1934 new planting was again possible only on land already alienated, but not yet under rubber. With the advent of I.R.R.S. in 1934 new planting was prohibited and has remained so ever since with the exception of 1939-40, when producers were permitted new planting up to 5% of their 1938 acreage.

Replanting, the uprooting of the mature trees and their replacement by a new stand, was free until June, 1934. From 1934 till December, 1938, a large measure of replanting was permitted, though no owner was allowed to replant more than 10% of his area in any one year or more than 20% over the whole period. From 1939 to 1941 replanting was freely permitted though formal approval had to be obtained from the Controller of Rubber. The planting provisions of rubber restriction apparently remained in force during the Japanese regime and still remain so, though their legal basis is somewhat slender, close on three years after the expiry of the regulation scheme. Moreover as late as August, 1946, the replanting of smallholdings felled during the Japanese occupation was also being discouraged by the authorities in some areas, apparently both on legal and on technical grounds, though there was no statutory basis whatever for this attitude.

The official policies of the last 25 years can be schematically summarized as follows:

TABLE 1. SCHEMATIC SUMMARY OF OFFICIAL POLICIES ON LAND ALIENATION AND RUBBER PLANTING IN MALAYA, 1922-46

Periods	Alienation of Land for Rubber Planting	New planting	Replanting
1922-28	Hardly any land alienated for rubber planting	Permitted, but officially discouraged	Permitted
1928-30	Land alienated with some restrictions, especially on alienation to smallholders	Permitted ..	Permitted
1930-34	None alienated ..	Permitted ..	Permitted
1934-38	None alienated ..	Prohibited ..	Permitted with some restrictions
1939-40	For 5% new planting only ..	5% permitted	Permitted
1941-	None alienated ..	Prohibited ..	Permitted

There has thus been very little alienation of land for rubber planting in Malaya over the last quarter of a century, especially for new planting by smallholders. A principal aim of this policy has been to protect the high-cost producers (the estates) operating in Malaya with large alien labor forces.

Most of these policies were unilateral on the part of Malaya. It was only the prohibition of new planting after 1934 which applied formally to all Eastern territories, and even in this instance it is very doubtful whether the prohibition was effectively policed in Netherlands India or in Siam. The outcome of these policies was, as could have been expected, a marked deterioration in the relative position of the Malayan rubber industry.

Between the end of 1925[5] and the end of 1940 the area under rubber in Malaya increased from 2,450,000 acres to 3,480,000 acres, while in other countries in the East the increase was from about 2,430,000 acres to approximately 6,780,000 acres[6] so that the share of Malaya in the total declined over this period from approximately one-half to about one-third. Over this period there were large increases in the planted areas of some of the low cost territories; in Sarawak from 90,000 acres to 240,000 acres; in Siam from 50,000 to 420,000 acres; in French Indo-China from 90,000 to 330,000 acres. Most important of all, in Netherlands India the area under rubber increased during this period from about 1,800,000 acres to close on 4,800,000 acres, with the native area alone rising from about three-quarter million acres to close on 3¼ million acres. Not only did these territories make very rapid headway against Malaya over this period, but the age composition of their planted areas has become much more favorable than in Malaya, with a large proportion of their rubber in the younger age groups.

The relative decline of the Malayan rubber industry and of the British section of the rubber industry generally, is illustrated in the following two tables.

[5] The peak year of the Stevenson boom.

[6] The figures are based on the Statistical Supplement to the "History of Rubber Regulation", (edited by Sir Andrew MacFadyean, London, 1944), rounded off to the nearest 10,000 acres. The official figure of 3,200,000 acres, casually referred to in a footnote in the "History of Rubber Regulation" (p. 83), has been adopted for the Netherlands India native area instead of the previous figure of approximately 1,800,000 acres.

TABLE 2. CHANGES IN AREAS UNDER RUBBER, 1925-40

(IN THOUSAND ACRES)

	1925	1940	1940 as % of 1925	Percentage of 1940 Area over 15 Years Old
Malaya	2,641	3,481	132	70
Ceylon	497	639	129	74
Netherlands India estates	980	1,567	160	49
Natives	750	3,200	425	23
Total Netherlands India	1,730	4,767	275	32
All other territories	540	1,370	254	38

TABLE 3. CHANGES IN AREAS UNDER RUBBER, 1925-40

(IN THOUSAND ACRES)

	1925	1940	1940 as % of 1925	Percentage of 1940 Area over 15 Years Old
Malayan estates	1,559	2,107	135	65
Smallholders	1,082	1,374	127	79
Total Malaya	2,641	3,481	132	70
Ceylon estates	321	359	112	82
Smallholders	176	280	159	63
Total Ceylon	497	639	129	74
Borneo estates	69	92	133	70
Smallholders	107	280	262	38
Total Borneo	176	372	211	46
British estates	1,949	2,558	131	67
Smallholders	1,365	1,934	142	71
Total British	3,314	4,492	136	69
Netherlands India estates	980	1,567	160	49
Smallholders	750	3,200	425	23
Total Netherlands India	1,730	4,767	275	32
French Indo-China estates	83	311	375	19
Smallholders	7	19	275	35
Total French Indo-China	90	330	365	20

It seems unnecessary to comment at any length on these tables whose implications are only too plain. The comparative position of Malaya and of Netherlands India, and particularly of the smallholders in these territories, is however, especially noteworthy. Between 1925 and 1940 the smallholders in Malaya increased their acreage by 25%, and Netherlands India by 325%; by 1940 four-fifths of the smallholdings acreage in Malaya was over 15 years old against less than one-quarter in Netherlands India.

To some extent the loss of the predominance of Malaya was inevitable, as no action on the part of the Malayan authorities could have prevented the spread of rubber cultivation in the native areas of Netherlands India or in Sarawak, Siam, or French Indo-China. But the unilateral policies pursued in Malaya were an important contributory factor to this rapid loss of ground. As is well known, the exorbitant prices of the Stevenson Scheme were a prime factor in stimulating the sudden vast extension of the native area in Sumatra and Borneo.

The political changes which have already taken place in Netherlands India, and others which are bound to follow, also affect the competitive position of the rubber industries of Malaya and Netherlands India. For a while the disorganization in Netherlands India will strengthen the position of Malaya, but this will eventually be eclipsed by a more permanent factor of great importance. For the first time since its establishment, the native industry in Netherlands India will cease to be governed by an administration in whose rubber policy the maintenance of the capital value of the European estates was the over-riding consideration. In due course this change is bound to affect such matters as restriction on planting, distribution of high-yielding material, and the taxation of estates and of native producers. It will probably have a profound bearing on the future of the rubber industry.

It is unlikely that more than two years will be required to reach a political settlement in Netherlands India and in French Indo-China and to restore the comparatively simple inland transport systems of these countries, as well as those of Sarawak and Siam. When this stage is reached, excess capacity is likely to develop on a much larger scale than in the 1930's. On any reasonable assumption on the prospective demand for natural rubber over the next decade or so, the demand can be entirely or almost entirely satisfied from these four low-cost producing territories if their mature areas are fully tapped. It is an interesting reflection on the deterioration of the relative position of Malaya (and of Ceylon) over the last two decades that in a few years' time the normal peacetime demand for natural rubber could be met without any contribution from the two territories, which less than 25 years ago considered their monopoly position sufficiently strong to operate a statutory restriction scheme without cooperation from any other territory.

The importance and the competitive strength of the Netherlands India native producers is much enhanced by their planting methods. Over large areas in the Outer Provinces of Netherlands India the natives have for many years past practised a shifting system of hill padi cultivation. They clear a small patch in the virgin jungle or in the *blukar* (secondary jungle) every year or every other year and establish a small paddy plot (*ladang*). After taking off one or two rice crops the area is abandoned and a new clearing is opened up which may in turn be an abandoned clearing of previous years. To add rubber to this system costs nothing in effort, cash, or displaced alternatives. The rubber seeds are planted simultaneously with the paddy; no care is expended on the holding after the rice crops are taken off, and five or six years later a young rubber plantation has grown up ready to be tapped. If in the future high-yielding material is distributed to native producers, these small plantations developed at no cost may yield well over 1,000 pounds per acre. It is also worth noting that less than one-quarter of the Netherlands India smallholdings area was more than 15 years old in 1940, as compared with three-quarters in Malaya. Moreover the experience of the 1930's has made it clear that a large part of this area can be tapped without the assistance of migrant labor from Java and thus without the comparatively high prices required to induce migration from Java to Sumatra and Borneo. Nor is this competitive threat from Netherlands India confined to conditions of free competition. If restriction again becomes the order of the day, the Netherlands India administration of the future will sooner or later (and probably fairly soon) stake out a claim for a quota commensurate to the acreage and competitive strength of the native producers.

Some of the advantages of the Netherlands India native producers are inherent in the situation or are the results of past policies and cannot now be eliminated by any action of the Malayan authorities; the costless planting, the vastness of the native rubber growing districts, the age composition of the Netherlands India native rubber area, and the recent political changes in Netherlands India are the most important of these advantages.

Yet the prospects of Malayan rubber need not be wholly unfavorable. The rubber both from Malayan estates and smallholdings is much better prepared than the Netherlands India native product, which often needs to be processed or reprocessed before shipment to consuming centers; with quantitatively negligible exceptions this does not apply to Malayan rubber. Again, the standards of tapping and cultivation (and possibly also the normal yield per acre) are probably higher on the Malayan smallholdings than they are in Netherlands India. Another advantage enjoyed by Malaya is the excellence of her communications and the proximity of the bulk of her rubber areas to the principal ports of shipment; much of the Netherlands India native rubber has to travel long distances and, when not produced close to a river, often over very poor roads before reaching the sea.

Some of these advantages are of minor, or only potential importance. But, if they were combined with very

low cost of production of a large volume of rubber, they might suffice to enable Malaya to produce rubber at a sufficiently low supply price to insure that a large part of the Netherlands India native area (as well as an appreciable portion of the tappable area of other producing territories) should be kept out of tapping. This condition can only be brought about by a vigorous policy of new planting, large-scale distribution of high-yielding planting material, liberal alienation of land on easy terms for new planting, and encouragement of low-cost producers, in short, by a complete reversal of the present policy.

Since the withdrawal of the Stevenson Scheme the policy of unilateral restriction has been condemned frequently by high-ranking government officers as well as by leaders of the planting community. There is an imposing array of emphatic British and Malayan Government statements to the effect that no suggestion would be entertained for the restriction of exports, production, or planting without cooperation from the other major producing territories, first and foremost Netherlands India. These statements were based on justified apprehensions, since American cotton and copper, Brazilian coffee, and, nearer home, Malayan rubber have all suffered grievous setbacks through gratuitous assistance given to their competitors by unilateral restrictions. In the face of overwhelming historical evidence, and in defiance of categoric governmental assurances, a policy of unilateral restriction of new planting is again being pursued in Malaya, whose planted acreage is now less than one-third of the total area of the principal producing territories and substantially less than the acreage of the rubber in Netherlands India, where there is not even nominal control of new planting. The high-cost producers are now being supported by measures which threaten Malaya with economic suicide. At a time when the political troubles in Netherlands India are presenting Malaya with an unexpected temporary competitive advantage, a policy is being pursued which, so far from exploiting this opportunity, is actually courting disaster.

It seems to be believed that the prohibition of new planting is in some way connected with the shortage of food, in particular with the scarcity of rice in Malaya; and that the policy reflects the desire of the authorities not to divert labor and resources from food production to the planting of rubber. This, however, is not so. Replanting is permitted, and this requires labor just as much as does new planting. Moreover heavy manuring is necessary for successful replanting (this is not necessary for new planting), and this procedure is thus particularly wasteful of resources.[7] Again, negotiations are at present in progress for the resumption of Indian immigration into Malaya, whose successful conclusion would add tens of thousands to the number of food consumers in Malaya who do not themselves produce any food. Thus the prohibition of new planting cannot be justified by reference to the shortage of food.

Effect of Planting Provisions on Smallholders

The prohibition of new planting, combined with free replanting, jeopardizes the very existence of the smallholdings industry in Malaya. The reason for this can be put quite simply. Replanting, which is feasible and is widely adopted on estates, is for economic and technical reasons impractical on smallholdings. Since 1934, replanting has been permitted, and indeed encouraged, while new planting has been prohibited (with one slight exception of which the Malayan smallholders were unable to take advantage). The gradual replanting of the estate area with high-yielding material, combined with prohibition of new planting, has gravely impaired the prospects of the smallholders. In the course of not more than 20 years or 25 years it might have led to the virtual elimination of the smallholders, however efficient they might have been at the outset and however ready to take advantage of high-yielding material. This matter was discussed in the recent *Economic Journal* article.[8] No distinction was made there, however, between the Malayan smallholders and the native producers in Netherlands India, and accordingly the acute threat to the position of the former, whose rubber is much older, was insufficiently emphasized.

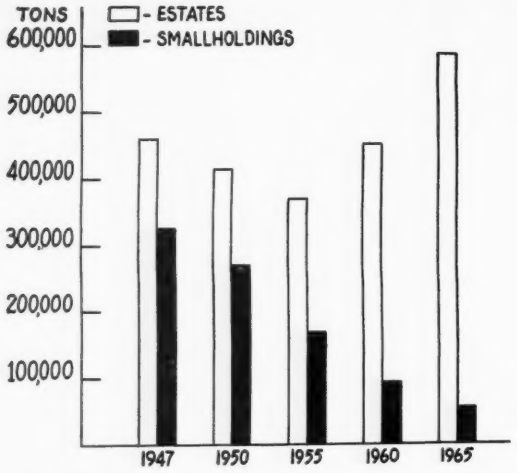
It is generally recognized that replanting by Malayan smallholders has so far been on a very small scale. It is clear from the various available data (which it is not proposed to review here) that by 1941 not more than 2% of the Malayan smallholdings acreage had been replanted, and that replanting by Malay owners or peasant proprietors was negligible. Moreover, as is candidly stated in the 1939 *Annual Report* of the Rubber Research Institute of Malaya,[8] much of the small amount of replanting undertaken on smallholdings was unsatisfactory, owing to catch-cropping by smallholders short of cash, lack of manuring, planting with unselected material, etc.

The estates, on the other hand, had replanted some 9% of their total acreage by the end of 1940. No figures are available on the area replanted in 1941, but it is known that it much exceeded the figure for 1940, when 49,000 acres, or 2½% of the Malayan estate area, was replanted. By the end of 1941 the acreage replanted on Malayan estates was probably around 14-15% of the 1940 area. Several estates representatives told the writer in Malaya that replanting assumed large proportions only in 1940 and 1941; by the beginning of 1941 several of the larger agency houses had worked out replanting programs ten years ahead for the replanting of the bulk of the older rubber on the estates under their control. Some 16-17% of the estate area was felled during the Japanese occupation, and the replanting of most of this area is already envisaged by the agency houses. Even if an appreciable proportion of the acreage replanted is on mediocre or even on poor soil, the superiority of modern high-yielding material over unselected seedlings planted 30 years ago is so great that the heavy replanting by the estate implies a substantial increase in their productive capacity while the smallholders are effectively barred from increasing their capacity.

The probable outcome of the planting provisions of rubber restriction still in force in Malaya emerges from Figure 1, constructed by W. G. G. Kellett, statistician of the London Rubber Secretariat. The main assumptions of the diagram, which refers to Malaya only, are these: new planting is prohibited; estates replant annually 80,000 acres, or 4%, of the 1941 Malayan estate area; yields on seedling estates already planted average 400 pounds per mature acre, and on budded estates 800 pounds per mature acre; yields on estates to be replanted in the future will rise from 100 pounds per acre at five years from planting, to 400 pounds seven years and to 1,200 pounds 12 years from planting (which is very conservative and particularly for the earlier years is definitely below the most current estimates); yields on smallholdings average 600 pounds per mature acre up to 30 years from planting and then gradually taper off until they drop to zero at 41 years. A note by Mr. Kellett on his assumptions is attached to Figure 1.

[7] The reason why manuring is required for replanting and not for new planting is briefly this. The annual output of rubber takes almost nothing out of the soil and no manuring is necessary to replace the plant food removed by the annual crop of latex. The growth of the tree and the annual leaf formation make, however, appreciable demands on the soil. The plant food available in most Malayan soils suffices for one stand of trees, but is insufficient for good growth of a second stand.

[8] P. 251



Estimated Approximate Future Productive Capacity of Malayan Estates and Smallholdings. Based on: 1. No New Planting. 2. Estates Replanting 80,000 Acres per Annum

This diagram is based on the following assumptions:

(a) There will be no new planting.

(b) Estates will replant with high-yielding material at a rate of 80,000 acres per annum.

(c) Yields on existing seedling rubber will average 400 pounds per acre per annum.

(d) Yields on existing budded estates will average 800 pounds per acre per annum.

(e) The following yields are assumed for estates to be replanted in the future.

Age (Years)	Yield (Lb./Acre)	Age (Years)	Yield (Lb./Acre)
5-6	100	9-10	700
6-7	200	10-11	900
7-8	400	11-12	1,100
8-9	500	12-30	1,200

(f) The following yields have been assumed for smallholdings:

Age (Years)	Yield (Lb./Acre)	Age (Years)	Yield (Lb./Acre)
7-30	600	36-37	400
31-32	575	37-38	300
32-33	550	38-39	200
33-34	525	39-40	100
34-35	500	40-41	50
35-36	450	Over 41	Nil

The same result can also be shown in a tabular form as in Table 4, which shows the prospective decline of Malayan smallholders' capacity based on the diagram.

TABLE 4. PROSPECTIVE DECLINE OF MALAYAN SMALLHOLDERS CAPACITY
(In Tons)

1947	320,000	1957	130,000
1948	300,000	1958	120,000
1949	280,000	1959	105,000
1950	260,000	1960	95,000
1951	240,000	1961	85,000
1952	225,000	1962	80,000
1953	205,000	1963	70,000
1954	185,000	1964	60,000
1955	165,000	1965	50,000
1956	150,000		

Thus if the present policy is continued, then on the assumptions of the diagram the smallholdings will be eliminated in about 20 years. The underlying estimates probably understate the physical productive capacity of smallholdings (though the yields assumed are still much higher than the *maximum* assessment under rubber restriction before the war, and *have about treble the average assessment of smallholdings under the Stevenson Scheme*), and may also exaggerate the decline in the physical capacity of the smallholdings, but they do not overstate the decline in the competitive position of the smallholders through the absolute and relative decline in the yields per acre on smallholdings against those on estates. Moreover the yields assumed on replanted areas are definitely conservative, and those assumed on smallholdings up to 30 or 35 years of age are reasonably generous. The diagram and the policies whose results it reflects are pregnant with serious implications.

It is important to note that even if new planting is permitted, refusal to alienate land may still endanger the position of the smallholders if on estates there is replanting on any scale. If no land is being alienated for rubber, new planting is limited to owners of land already alienated, but not yet under rubber, i.e., unplanted reserve land, or land carrying other crops which would be cut down for the purpose. Smallholders very rarely have unplanted reserve land, and most of their new planting could take place only by uprooting of fruit trees or food crops. This they might be unable, or unwilling, to do. Thus, refusal to alienate land for rubber planting has in many instances much the same effect as prohibition of new planting on smallholdings. If, meanwhile, estates are replanting with high-yielding material, the position of the smallholders would be jeopardized in much the same way as it was (and is) by the planting provisions of rubber restriction. Indeed their position might even be worse, as some estates might now plant on their reserve land, as well as replant their existing stands. With brief exceptions rigid refusal to alienate land for rubber planting has been the official policy since 1922; the implications of this policy, both on the competitive position of Malaya as a whole and on the relative position of estates and smallholdings, do not appear to have been fully appreciated.

Results of 1939-40 New Planting Provisions

As an exception to the general prohibition of new planting under rubber regulation, since 1934 new planting to the extent of 5% of the 1938 planted acreage was permitted in 1939-40 under the regulation scheme. The Malayan acreage statistics suggest at first sight that this new planting was fully taken up both by estates and by smallholdings. The smallholdings acreage even shows an increase of 8% from 1,264,678 acres at the end of 1938 to 1,361,128 acres at the end of 1940. This increase must include a subtantial acreage revision, since according to the official statistics of the Controller of Rubber and of the Department of Agriculture, new planting by smallholders totaled only 50,956 acres over this period; some 47,000 acres are stated to have been planted in 1939, and more than 3,000 acres in 1940. From these figures it would appear that new planting by smallholders in 1939-40 totaled some 4% of their 1938 area of just over 1¼ million acres. Over the same period new planting by estates was 112,000 acres, or 6% of their 1938 area. Closer analysis of the new planting statistics and personal observation in Malaya suggest, first, that actual new planting by all owners of 100 acres was almost certainly less than 51,000 acres and, secondly, that new planting by Malays and by resident owners generally was negligible.

The 1939 *Annual Report* of the Rubber Research Institute of Malaya summarizes the approved applications for new planting by smallholders for the 11 months up to and including November, 1939. The figures were supplied by the Controller of Rubber and cover all approved applications for new planting of five acres or less (i.e., 5% of 100 acres, holdings over 100 acres being estates). Altogether there were 8,420 applications, totaling 16,649 acres. As approved applications for new planting of five acres and less thus totaled only some 17,000 acres, the remaining 30,000 acres of new planting in 1939 must all have been undertaken with the help of purchased planting rights, as the owner of even a 100-acre holding received new planting rights for five acres only. Owners who were in a position to plant 10 to 20 acres in 1939-40 with purchased planting rights were

[9] P. 252.

(Continued on page 642)

Development of Methods of Chemical Analysis of Synthetic Rubber

Willard P. Tyler[1] and T. Higuchi[2]

THIS article is one of the several presented before the A. S. T. M. Symposium on Rubber Testing, held in connection with the fiftieth annual meeting of that Society in Atlantic City, N. J., June 16-20, 1947. The symposium, sponsored by Committee D-11 on Rubber and Rubber-Like Materials, attempted to cover the work that has been done with regard to the physical and chemical methods of test, both on synthetic and natural rubbers, making available to industry the accomplishments of government and industry during the period of the war, when secrecy had to be maintained. All of the papers will be published in a separate booklet by the Society some time within the next few months. EDITOR.

THE purpose of this paper is to trace the development of chemical testing of synthetic elastomers during recent years and to discuss the present status of these analytical methods. As the synthetic rubber industry expanded rapidly, it became necessary to find chemical as well as physical methods to control the product within specification limits. It was also necessary to provide chemical methods for the identification of synthetic elastomers and for chemical analysis of compounded synthetic stocks.

It is only fair to state that even as late as 1942 the available information regarding such chemical methods was negligible. Furthermore, even after this critical initial period, there was disagreement as to what specifications and chemical tests were necessary. It is true that several rubber and petroleum manufacturers had made synthetic elastomers before this time, but no concerted effort to standardize on process or methods of testing was made prior to the inception of the government synthetic rubber program.

The synthetic rubbers, more properly called synthetic elastomers, to be discussed in this paper are, for the most part, the three elastomers known to the industry by Rubber Reserve Co. names of GR-S, GR-M, and GR-I, and the oil resistant butadiene-acrylonitrile copolymers. GR-S is the large-tonnage general-purpose elastomer, a copolymer of butadiene and styrene; GR-M is a polymer of 2-chlorbutadiene-1,3 having special uses; GR-I is a nearly saturated copolymer of isobutylene and isoprene, particularly useful for inner tubes. The greater part of this paper will be devoted to GR-S since the cooperative work sponsored by Rubber Reserve dealt largely with this elastomer with the result that more information is available concerning it than about any of the others.

Development of Chemical Test Methods for Crude GR-S

Specification Test Methods

During 1942 the subject of quality control of GR-S was of vital importance to the committees which were active under Rubber Reserve Co. in planning specifications and test methods. Since there were virtually no existing data on the subject, the first test methods were borrowed from the files of the natural rubber chemist. As a result, the early methods adopted for synthetic elastomers were very similar to those found in the A. S. T. M. standard methods for natural rubber.

The following chemical tests have been used for quality control since the inception of the methods, but there have been many changes in the procedure:

1. Heat loss or volatile matter (largely moisture).
2. Ash.
3. Organic solvent extract (largely non-rubber constituents).
4. Fatty acid (as stearic acid or other specific acids).
5. Soap (as sodium stearate or other specific soaps).

Heat loss was originally run by the oven method; ash and acetone extract were run by methods essentially the same as in A. S. T. M. designation D 297-43T—Tentative Methods of Chemical Analysis of Rubber Products.[3] Fatty acid was originally titrated in an acetone extract or in a mixture of benzene and alcohol used to swell the GR-S and extract the fatty acid. Soap was also determined by titration in a benzene-alcohol solution of swelled GR-S.

As a result of extensive cooperative testing programs between plant laboratories and of research by rubber laboratories and the National Bureau of Standards, some important changes were made in the methods during 1944. Heat loss by the oven method was found to be unsatisfactory and was supplanted by the volatile matter method, in which the loss in weight on milling a large sample at mill roll temperature of 200 to 220° F. was measured.

Ethanol-toluene-azeotrope (E-T-A), 70 volumes of ethanol to 30 volumes of toluene, was introduced as a superior swelling agent for GR-S and a solvent for the non-rubber organic constituents. The extraction was made by refluxing in a flask instead of by A. S. T. M. methods. This change resulted in a great saving of time essential to control work. The E-T-A extract was determined by weighing the residual dried rubber. The soap and fatty acids were determined by conventional titration methods on aliquot portions of the E-T-A extract. The ashing procedure was speeded up by the use of an unorthodox modification in which the rubber samples were placed directly in a muffle furnace at 550° C. Contrary to the expectations of many chemists, the results obtained by this method proved highly satisfactory provided the door of the furnace was not opened during the first hour of heating.

The "Specifications for Government Synthetic Rubbers—Effective January 1, 1946"[4] contain substantially the same chemical test described in the previous paragraph. However, a method has been added for the determination of water-soluble ash content for the purpose of testing rubber to be used for electrical insulation. Recent proposed changes in these procedures have been studied and will probably be put into general practice.

[1] Research laboratories, B. F. Goodrich Co., Akron, O.
[2] University of Akron, Government Laboratories, Akron, O.
[3] "1946 Book of A. S. T. M. Standards, Part III-B," p. 939, American Society for Testing Materials, Philadelphia.
[4] Reconstruction Finance Corp., Office of Rubber Reserve, Washington, D. C.

The use of aluminum cups for ash analysis has proved to be a time saving and inexpensive innovation. An increase in the temperature of the E-T-A extraction is to be initiated, and the substitution of metacresol purple indicator for the indicators now used in fatty acid and soap titration has been approved.

Special Methods for Soap and Fatty Acid

Although only sodium soap is commonly reported in GR-S analysis, others such as calcium, magnesium, aluminum, and iron are also present in many cases in predominant quantities. The type and relative amounts of these insoluble soaps are dependent largely on the method of coagulation used and the hardness of the water employed in the washing procedure. Methods of testing for some of these soaps have been developed.

Since soaps other than the alkali metal soaps are relatively insoluble in E-T-A, they are difficult to remove during the extraction procedure. It is possible, however, to estimate the total quantity of the soaps present by dissolving the polymer sample in benzene-methanol (85-15) and titrating the resulting solution with standard acid. Some indication of the insoluble soap content can be obtained by subtracting the E-T-A soap value from the total solution soap value. Since alkaline earth soaps are extracted to a slight extent by E-T-A, more reliable determinations of alkali metal soaps can be obtained by removing the traces of less soluble soap in the E-T-A by chilling and filtering.

Fairly good estimation of the alkaline earth soaps can be obtained by ashing the polymer sample and determining the calcium content by one of the usual methods. Where appreciable calcium soap content is suspected, it has been recommended that the sodium soap content be found by subtracting the calcium soap content obtained by the ashing procedure from the total solution value.

Soap and fatty acid analysis in alum-coagulated polymers (GR-S-AC) present a considerably more difficult problem than in salt-acid coagulated polymers. The latex soap is converted to fatty acid and polymer-soluble mixed aluminum soaps by aluminum sulfate during the coagulation process. Ordinary E-T-A extraction results in removal of only the free fatty acid. The major portion of the aluminum soap resists even prolonged extraction.

Ethanol-toluene-azeotrope containing 5% of water has been found to remove not only the original fatty acid, but also an additional amount produced by hydrolysis of a large portion of the aluminum soaps. Although this method is in current use in the rubber industry, it leaves an appreciable amount of aluminum soap in the polymer untouched.

Recently a method that utilizes a mixture of E-T-A and glacial acetic acid as the extracting solvent has been proposed. In this procedure the aluminum soaps are completely hydrolyzed by the acid. The resulting free fatty acid is estimated by titrating the hydrocarbon layer with standard base after removal of the acetic acid by water washings. The aluminum content of the polymer is determined by bisulfate fusion of an ashed sample and volumetric determination of the aluminum by the fluoride method (1).[5]

Advances have also been made in the titration of soap and fatty acid in E-T-A containing additional alcohol by using the electrometric method with a glass electrode and pH meter. The accuracy of end-point detection appears to be greatly improved over that obtained by the older method.

Analysis of Carbon Black in GR-S Black Crude

The development of the carbon black analysis methods is an interesting example of the research and development effort which has gone into improvement of the analytical tools necessary to wartime production and more efficient peacetime production of GR-S.

GR-S black masterbatches are not standard production items. The carbon black is incorporated as a slurry in the latex and, as soon as this process was initiated, it became necessary to run control tests on the products. The A. S. T. M. procedure as given in method D 297-43T[3] was first used and found unsatisfactory not only because it was too time-consuming for control work, but because erratic results were obtained. At least two rubber research laboratories studied this method, and several major changes were evolved which eliminated many of the difficulties and errors of the method as applied to crude GR-S black. The changes involved elimination of washings unnecessary with an uncompounded stock, the use of filter aids, methods of preventing peptization of the finely divided black, and the elimination of the empirical factor which had always been used with this analysis by drying the carbon black at 200° C. It is felt that while these improvements are not the final answer to the problem of control of GR-S black masterbatches, they will be of value to the rubber industry in future analysis of synthetic and natural rubber compounds for carbon black.

Another method which has been widely used for control, but not accepted as a referee method is based on density determination under pressure in an instrument described by Palmer and Jones (2).

The present referee and control method was developed by synthetic rubber laboratories and the National Bureau of Standards. This method is based on a principle which many laboratories had previously tried with indifferent success, the distillation of the rubber from the carbon black and ash in an inert atmosphere and subsequent burning of the carbon black in oxygen. The method is quite rapid if two combustion furnaces are available, and it has only one disadvantage, standard sample blanks must be run with each set of samples to correct a slight empirical error in the method. The somewhat empirical nature of the method and the problem of what will happen to the ash, when it is ignited first in an inert atmosphere, then in oxygen, may prevent this method from becoming generally useful in the analysis of compounded synthetic and natural rubber stocks, but there will be at least limited applications of considerable value.

Analysis of Crude GR-S for Stabilizer

Most of the standard stabilizers or rubber antioxidants added during manufacture of GR-S are secondary aryl amine derivatives. The primary analytical method used for control and material balance check is, therefore, based on the familiar reaction with nitrous acid to form a nitroso derivative. The original method was a volumetric titration of an acetic acid solution of the dried acetone extract with standard sodium nitrite solution using starch-iodide paper as an external spot end-point indicator. This method has gone through several modifications in which solvents for extraction have been changed. Some of the modifications include potentiometric determination of the end point, which has usually proved to be much superior to external spot indicator end-point detection.

Colorimetric methods have also been used based on the reaction of the stabilizer with tertiary butyl hydroperoxide and stannic chloride in an acrylonitrile solution.

Most laboratories have had very good success with a spectrophotometric method based on the characteristic ultra-violet absorption spectra of the antioxidants. Since

[5] Bibliography references appear at the end of this article.

the method normally depends on solution of the rubber in a solvent such as ethylene dichloride, it has some disadvantage with rubbers which are only partially soluble or which form "microgel" which will scatter light. However specification GR-S is normally sufficiently soluble for the use of this method, and the present standard method for plant control is a spectrophotometric method. Another similar method has been worked out in detail by Banes and Eby (3).

All of the methods require standardization by the use of samples of the specific antioxidant which is being analyzed. In some cases of plant control it may even be necessary to use samples of the same lot of antioxidant used in the rubber sample in order to standardize solutions or calibrate instruments.

Determination of Combined Styrene

Probably more methods of determining the combined styrene content of GR-S have been proposed than for the determination of any other component of the copolymer. None of the methods was entirely satisfactory from a practical point of view. In general, relatively simple methods have been found to be comparatively inaccurate; precise methods require either excessive time or expensive, specialized equipment that was not available during the war.

Early in the rubber program three methods were considered. These were based on iodine number of the polymer, optical refraction of the solid polymer, and optical refraction of polymer solutions. In addition, ultraviolet absorption, combustion, and wet oxidation have been used to some extent. These methods are considered in turn.

Iodine Monochloride Addition Method. Some of the earliest efforts to determine the bound styrene content of GR-S made use of the fact that iodine monochloride could be added nearly quantitatively to the residual double bound of the copolymerized butadiene unit without disturbing the styrene linkages. The procedure consisted essentially of dissolving the polymer in a suitable solvent and determining the iodine number, using iodine monochloride as the addition agent. The method followed in general the technique of the standard Kemp-Wijs method (4) employed for natural and synthetic rubber studies. This method never came into common practice, largely because accompanying side reactions made quantitative evaluation difficult.

The method, stimulated by recent studies, has lately received renewed attention. It has been shown that it is possible to correct quantitatively for the substitution side reaction by determining the acid so produced. Although the modified method shows considerable improvement over the old, greater precision is still desirable. Interest has been aroused by the possibilities of determining styrene content of vulcanized compounds.

Refractive Index Method. Since refractive indices of polystyrene and polybutadiene differ by approximately 0.070-unit, an analytical method based on estimation of bound styrene content as a function of the refractive index of the solid polymer received early consideration. A simple extension of the method developed earlier at the National Bureau of Standards by McPherson and Cummings (5) for natural rubber studies was first tried. A purified GR-S sample was cold-milled, pressed thin (less than 0.01-inch) between sheets of aluminum foil under pressure, and heat and was placed on a refractometer of the Abbé type immediately after removal from the foil. Refraction was read by transmission or reflection. The field contrast in most cases was, however, relatively poor.

The method possessed two principal drawbacks: (1) only highly purified samples, free from any solvent, could be used; and (2) the relation between bound styrene content and refractive index deviated sufficiently from linearity to necessitate careful calibration by some other method.

Purification of samples by E-T-A extraction procedure, described previously, was found to suffice for routine purpose in the majority of the cases. The readings were usually reproducible to ± 0.0003-unit corresponding to approximately 0.3% variation in the bound styrene content. Alum-coagulated GR-S, however, could not be purified by this method since the residual aluminum soap in the polymer was not removed. For such samples it was necessary to add a trace of hydrochloric acid to the E-T-A to hydrolyze the soap to facilitate its extraction.

The relation between refractive index and the bound styrene content generally accepted today, was determined by the combustion method described later. The curve has been checked especially in the neighborhood of the GR-S range.

$$\%\,\text{Styrene} = 22.94 + 0.118(n_D - 1.5339 \times 10^4 - 234(n_D - 1.5339)^2$$

Unfortunately this relation is not altogether in accord with some of the results obtained by the ultra-violet and halogenation methods.

Solution Refraction. The relative refractive indices of solutions of purified GR-S in benzene have been correlated linearly with the bound styrene content of the copolymer. Since the differences in the refractivity of the solutions involved are very small, it was necessary to employ a refractometer of the Rayleigh interferometer type for this work. Only one of these instruments was available to the rubber program; hence the method could not be adapted for routine purposes.

Ultra-Violet Absorption. Polystyrene possesses a strong ultra-violet absorption peak at 262 millimicrons. This peak shifts to 260 millimicrons in the copolymer. Since polybutadiene does not exhibit appreciable optical absorption in this spectral region, a method has been developed to determine the bound styrene content of copolymers through the ultra-violet absorption characteristics of chloroform solutions of the copolymer.

Principal drawbacks of the method were that gelled polymer, insoluble in chloroform, could not be thus analyzed, and that the presence of impurities exhibiting strong ultra-violet absorption in this spectral region, such as stabilizer, oxidation products of stabilizer, and hydroquinone, produced large analytical errors. Since oxidized stabilizer cannot be completely removed from the copolymer by extraction or by any other known means, the method was not applicable to production samples.

Combustion. The combustion method, based on the difference in the carbon-to-hydrogen ratios of butadiene and styrene, has been accepted as the only absolute method available today for the determination of bound styrene. Since the carbon-to-hydrogen ratios do not differ greatly for the two monomers, extreme care in analytical technique is necessary to yield moderately precise results. The method has been used to correlate refractive indices with bound styrene contents of the copolymers.

Oxidative Degradation Methods. If GR-S is oxidized first with nitric acid and then with alkaline permanganate, the styrene links are converted quantitatively to para-nitrobenzoic acid. Since butadiene units do not yield more than a trace of ether-soluble acid it is possible to determine the percentage of combined styrene in the original polymer from the amount of standard base required to titrate an ether solution of the acidic oxidation product. The method is only approximate and fails badly with high styrene rubbers.

Determination of Free Polystyrene

Because of the similarities in the chemical composition and the molecular structures of free polystyrene and GR-S, the determination of polystyrene presents a difficult analytical problem. Although no entirely satisfactory method is now available, several approaches have been suggested.

If GR-S in solution is treated with iodine monochloride, it forms an addition compound of considerably reduced solubility. Limited separation between this compound and polystyrene, which does not add iodine monochloride, is thus possible. A method has been suggested in which a concentrate of the more soluble polystyrene is obtained and weighed. However the method has been found useful only where relatively large amounts of polystyrene were present. Small amounts were generally obscured by the varying solubility characteristics of different GR-S samples.

A simpler and more rapid method has been proposed recently. Since butadiene linkages are susceptible to oxidative scission, it is possible to fragmentize GR-S chains into alcohol-soluble low molecular weight units. Polystyrene molecules, on the other hand, are generally more resistant to oxidative breakdown and usually remain alcohol-insoluble after the oxidative treatment. Tertiary butyl hydroperoxide and osmium tetroxide have been suggested as the oxidizing agent and catalyst, respectively. Unfortunately, low molecular weight polystyrene appears to be solubilized to some extent by the oxidative process. The method, however, seems to be feasible for the detection of polystyrene in GR-S in concentrations greater than 5%.

Chemical Testing of Other Synthetic Rubbers

The only information available on chemical tests used with GR-M, GR-I, or butadiene-acrylonitrile copolymers is that which appears in the "Specifications for Government Synthetic Rubbers" and those methods collected in the A. S. T. M. designation D 833-46T, Tentative Methods of Identification and Quantitative Analysis of Synthetic Elastomers,[6] which are discussed later in this report.

The specification test methods for GR-M and GR-I include only volatile matter and ash. The volatile matter in GR-M, however, is run on a mill at 120 to 150° F. The analysis for volatile matter in GR-I is conducted in an oven at 105° C.

Identification of Synthetic Elastomers and Natural Rubber

One of the difficult analytical problems that has faced the rubber industry since the advent of large-volume synthetic rubber production is the identification of the elastomers in the crude and vulcanized state, singly and in mixtures.

There is one practically complete solution to this problem, but unfortunately it requires equipment not found in the average small laboratory and also requires long and careful sample preparation. This unique solution is the method of infrared absorption spectroscopy. Barnes and his co-workers (6) have made important contributions in this field, and a publication released recently by Dinsmore and Smith (7) gives in great detail the analytical procedures used with this method. The method is applicable to all the synthetic elastomers and to natural rubber in the crude or vulcanized state, and most mixtures of elastomers can be identified. In many cases quantitative analysis can also be made. The sample preparation, however, takes several days since before analysis can be made the sample must be extracted, dissolved in a suitable solvent, separated from all pigments, concentrated by vacuum evaporation, spread in a film by a special technique, and freed from all traces of solvent by vacuum drying.

The most rapid methods of identification are those based on the work of Burchfield (8). These methods are based on properties of the pyrolysis products of the elastomers and include spot tests and solution tests made on them. These tests, together with a number of longer procedures for confirming the presence of elastomers, have been collected and published in A.S.T.M. Method D 833.[6]

A discussion of detail is not in order in this paper. It is sufficient to state that nearly any single elastomer, crude or vulcanized, may be identified as to type usually within a few minutes. It is only fair to say further, however, that mixtures present a much more complicated problem for the analyst. One of the most common mixtures, GR-S and natural rubber, is of particular interest to rubber reclaimers. This combination is only partially identified by the rapid methods. However nearly all mixtures can be identified by a combination of the methods in this collection, although several hours' work may be necessary in some cases.

Quantitative Analysis of Synthetic Elastomer Compounds

Method D 833[6] also contains a section on analysis of compounds, which should be regarded more as a guide than as detailed directions for analysis. It is freely admitted that an insufficient amount of work has been done on this phase of synthetic analysis, but it is safe to say that, in general, the methods applicable to analysis of compounding ingredients in natural rubber will apply to most synthetic elastomers. There are notable exceptions, particularly when dealing with GR-I which will not react with nitric acid and which is therefore not amenable to the usual treatment for carbon black and sulfur determination. It is also not possible to determine free sulfur in GR-I by the standard direct methods, although an indirect method has been proposed by Rehner and Holowchak (9). It should be noted that the analysis of butadiene-acrylonitrile copolymer and GR-M compounds for elastomer content is simplified by the presence of the readily determined nitrogen and chlorine.

The Needs of the Future

It is obvious from the foregoing discussion that a number of problems in chemical analysis still confront the rubber industry. Briefly summarized, the major needs are as follows:

1. Rapid methods for the identification of all synthetic elastomers and natural rubber in all commonly used mixtures of crude and vulcanized rubber compounds.
2. A more rapid and accurate method of analysis of bound styrene in crude GR-S.
3. A rapid method for determination of GR-S content of a compounded vulcanized compound. This might come as a result of solution of item 2.
4. Adequate direct methods for the determination of free sulfur in GR-I compounds.
5. A study of the pyrolysis carbon black method on vulcanized compounded rubbers.
6. Further studies on methods of determining soap content of crude synthetic elastomers.

The authors wish to thank the many chemists whose

(Continued on page 640)

6 "1946 Book of A. S. T. M. Standards, Part III-B," p. 969.

The Effect of Airbag Thickness on the Cure of a 6.00x16 Tire[1]

H. A. Freeman[2]

THE curing time and temperature required for a tire are influenced by many factors, among them the combined thickness of both the tire and the curing bag. It can be demonstrated that the cure time cycle could be reduced from 30 to 40% if a thin inner tube could be substituted for the present-day conventional airbag during the tire cure. This substitution, however, is impracticable because (1) the thin tube buckles or collapses on multiple cures and (2) with its use the tire bead cannot be adequately shaped.

Many attempts have been made over the years to eliminate the use of the airbag entirely; however, a discussion of the problems involved in this project are beyond the scope of this discussion.

Because of the appreciable effect of the dimensions of the airbag on the curing time, a study of the effect of variations in dimension and contour of the bag on the curing time was considered desirable, particularly in view of current demand for more tires a day per mold.

It is the purpose of this paper to show the manner in which the airbag affects the cure of a pneumatic automobile tire.

Discussion

The study of the flow of heat during vulcanization in a tire and its curing bag does not readily adapt itself to mathematical calculations.

As pointed out by Ira Williams:[3] "The heat relations at the center of a slab, square bar, cube and long cylinder of rubber are quite different, even when their surfaces are at the same temperature."

Obviously the tire and bag together are neither slab, cylinder, cube, or square in shape. Moreover heat applied on the outer surface of the tire through the tire mold produces one temperature, and heat applied through the airbag wall produces another and changing temperature. For this reason reliance is usually placed on temperature measurements using thermocouple junctions placed in various locations throughout the tire during cure.

In this study the effects of a tire cure, using bags of varying dimensions, were followed by this method.

Experimental Procedure

For a study of curing conditions with a 6.00x16 tire, thermocouples are located as shown in Figure 1. The tire is placed into its vulcanizer under known curing conditions.

Temperature readings are taken with a potentiometer at definite times during cure. From the data thus obtained the state of cure in the rubber at the thermocouple locations is calculated by converting the temperature readings to curing rate values and plotting the curves according to the method of T. K. Sherwood.[4] The amount of cure at each thermocouple location is then determined. The compounder is interested in these data when converted to equivalent cure[5] at a single temperature. The equivalent cure is the amount of vulcanization the rubber would get if it were cured in the form of a sheet in a press at a given temperature. Thus the tire cure can be evaluated in terms of known laboratory cures.

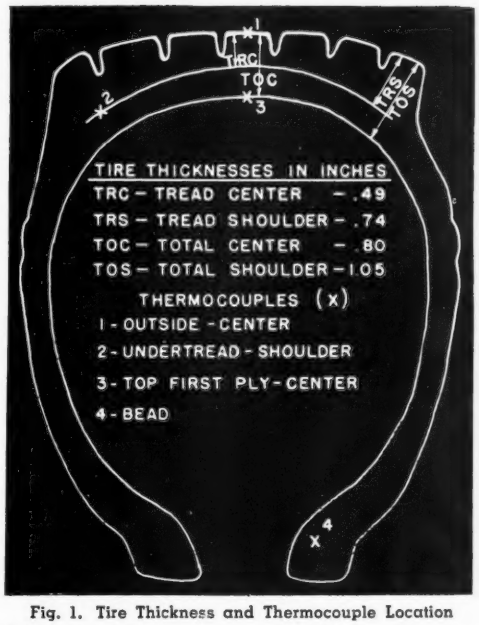


Fig. 1. Tire Thickness and Thermocouple Location

The cure results in the following study will all be given in terms of "minutes at 260° F. equivalent cure." This equivalent cure which the tire receives in the mold or "under pressure only" is given. For total cure, including that which the tire gets on cooling after pressure release, add from 20 to 30 minutes at 260° F. equivalent cure for the carcass and undertread. Cure temperature and time in each of the tests that follow are adjusted to give about 115 minutes at 260° F. equivalent cure on the outer tire tread center. The tests were made in 40-inch platen-type individual vulcanizers.

Test Data

A standard 6.00x16 four-ply rib-tread-type tire was used for each test.

The thickness of the various parts of the tire are also shown in Figure 1.

TEST 1. COMPARISON OF AIRBAGS OF DIFFERENT THICKNESS UNDER THE SAME CURING CONDITIONS WITH THE SAME TIRE

	Airbag Thickness in Inches		
	Bag A	Bag B	Bag C
Crown	0.69	0.61	0.55
Sides	0.77	0.66	0.58
Base	1.45	1.38	1.37
Bag weights *(in lbs.)*	46	42½	40
Effect on Tire Cure (Equivalent Cure in Minutes at 260° F.)			
Undertread	45	49	53
Top first ply—center	38	52	58
Top first ply—s.w.	78	93	105
Bead	42	49	52

[1]Presented before Division of Rubber Chemistry, A.C.S., Cleveland, O., May 26, 1947.
[2]Goodyear Tire & Rubber Co., Akron, O.
[3]"Thermal Properties of Various Pigments and of Rubber." *Ind. Eng. Chem.*, 15, 154 (1923).
[4]"Heat Transfer in the Vulcanization of Rubber." *Ibid.*, 20, 1181 (1928).
[5]Park and Maxwell, "Temperature Coefficient of Vulcanization." *Ibid.*, 24, 148 (1932).

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As the thickness of the curing bag is decreased, the amount of vulcanization the tire receives is increased. This proportion approaches an inverse ratio, but not to any degree of accuracy because of the variables in bag and tire contours from one design and size to another. The increase in the degree of cure is, of course, greater in the carcass than in the tread of the tire.

Conversely, as the curing bag is made thicker, the amount of cure the tire receives decreases. If the bag is too thick, the carcass of the tire particularly will probably be undercured. In test No. 1 above, the change in thickness is constant circumferentially around the bag. Thus an increase of 0.1-inch in bag thickness gave a decrease in the cure of the tire carcass of more than ten minutes at 260° F. equivalent cure. When the increase in thickness is inadvertently concentrated at one spot, such as may occur with the use of a thick patch in bag repair, undercure is likely to result in the carcass of the tire at that spot. Thick patches used in bag repair or an excessive thickness at the bag splice, or any other similar concentration of airbag thickness will cause the tire carcass to "blow" because of undercure at the spot opposite the localized increase in airbag thickness. Tire compounders are familiar with this source of trouble. The airbag, then, should be constant in gage or thickness circumferentially.

Test 2. Effect on Tire Bead Cure of Airbags of Various Base Thickness

Bag Base Thickness in Inches	Tire Bead Cure Equivalent Cure in Minutes at 260° F.
1.20	64
1.60	48
1.75	43
2.10	33

The same tire was used for each cure. Each bag was cut and measured for thickness after its use in the tire. The data show that a decrease in bag base thickness results in an increase in the tire bead cure.

For this given situation the ratio is about three minutes at 260°F. increase in cure of the tire bead for each 0.1-inch decrease in the thickness of the base of the bag. However this will vary according to the bag and tire size, type, and cure.

Test 3. Effect on Carcass Cure with Cure Adjustment for Tire Bead

I. Adjustment of Cure for Tire Using Heavy Base Bag

Airbag Gage in Inches

Crown	0.54
Sides	0.67
Base	1.90

Cures (in Minutes)	A	B	C	D	E
Bag steam at 200 lbs. (388° F.)	9	12	4	11	11
Bag air at 215 lbs.	30	27	50	33	43
Deflate bag	1	1	1	1	1
Total time	40	40	55	45	55
°F. on platen	297	297	288	293	288
Equivalent Cure in Minutes at 260° F.					
Undertread	57	65	58	72	96
Top first ply (center)	67	92	47	102	128
Bead	35	39	52	47	60

Let us assume the desired cure on the carcass and undertread of the tire under pressure is a minimum of 50 minutes at 260° F. In order to get this amount of cure in the bead with an airbag having a thick base, cure time is necessarily lengthened. Some cure gain at the bead may be obtained by increasing the amount or time of the airbag steam pressure within the same curing cycle. See 1B as compared to 1A. However this method is limited by the resulting greater increase in the cure of the tire sidewall. In comparing 1A above to 1C, it is noted that the total curing time cycle was advanced from 40 to 55 minutes in order to cure the bead using the same thick base bag with no increase in carcass cure. With an increase in airbag steam as in 1D and 1E, the carcass cure became unbalanced.

Test No. 3 II. Comparison Cure, Heavy Base Air Bag with Thin Base Air Bag

	Airbag Gages in Inches	
	A (Same as I above)	B
Crown	0.54	0.55
Sides	0.67	0.69
Base	1.9	1.25
	Equivalent Cure in Minutes at 260° F.	
Undertread	57	55
Top first ply	67	65
Bead	35	63

These data show that an increase in the cure at the bead within the same time cycle can be obtained, along with a well-balanced cure on the tire carcass by using an air bag with a thinner base as in II B.

Conclusions

From this study of the flow of heat through a tire and its air bag during vulcanization, the following conclusions may be drawn:

(1) Tire cure, at a given point in the tire, depends upon the *total* thickness of the tire and the bag at that point.

(2) Increase in airbag thickness at any given point subtracts cure from the tire at that location. This cure retardation is greatest at carcass and diminishes in intensity toward the outer tire next to the mold.

(3) The volume of airbag rubber at its base has a considerable effect on the tire bead cure. Either widening the base from side to side, or thickening the base from outer to inner wall, will subtract cure from the tire bead.

(4) More cure on the tire bead, within a given cycle time, can be accomplished by thinning the bag base.

(5) More cure on the tire bead can be obtained, up to the point of proper sidewall cure, by increasing internal bag heat. When this heat exceeds best tire sidewall cure, internal heat must be lessened and cure cycle time increased.

Chemical Analysis of Synthetic Rubber

(Continued from page 638)

work in research and cooperative testing programs has made possible the advances in methods of chemical testing for synthetics. Most of these chemists will receive no recognition in the form of publication of their work except as private communications to the Rubber Reserve Co. To this group, in particular, full acknowledgment of their contribution is hereby made.

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Synthetic Rubber—A Protected or a Free Industry[1]

Ralph F. Wolf[2]

THIS article by Ralph F. Wolf is an excellent addition to the one presented last month by W. J. Sears, since Mr. Wolf's article expresses a quite different point of view on future policy with regard to synthetic rubber in this country. Mr. Wolf was formerly Chief, Synthetic Rubber Allocation Section, Rubber Branch, WPB and consultant on GR-I to the Office of the Rubber Director. He is also the author of "India Rubber Man — the Story of Charles Goodyear" and other works. EDITOR.

SHOULD the United States scrap its synthetic rubber industry? It is doubtful if anyone feels that this scrapping should be done in the sense that the plants producing synthetic rubber should be physically dismembered and pounded flat into scrap metal. Rather, when this question is asked, the intent is: Should the government apply a tariff to natural rubber or continue to subsidize the production of synthetic rubber so that industry will continue to use home-made synthetic in preference to imported natural material? By subsidy is meant either direct financial aid or indirect government assistance through compulsory use.

Any such tariff or continued subsidy should not be considered. Instead, absolutely free competition should exist between natural rubber, regardless of source, and the various types of synthetics.

Under such conditions we will use natural rubber (both native and plantation—the proportions depending importantly on developments in the Dutch islands); we will certainly use the synthetics which have desirable qualities not possessed by natural rubber, and in this class should be placed Butyl and the oil resistant materials such as neoprene, "Thiokol," and the nitrile rubbers; and we may possibly continue large-scale use of the present GR-S.

The latter constitutes by far the greater part of our domestic production and is the material we are really talking about when we say synthetic rubber. Majority opinion among rubber industry technicians is that a better tread can now be made out of GR-S than can be made out of natural rubber. However, it is not sufficiently better to enable GR-S to hold its ground against markedly cheaper natural rubber or against an advertising campaign deliberately designed to convince the public of the desirability of buying some one's "one hundred per cent. natural rubber tire."

A Better All-Purpose Synthetic?

If a vastly superior copolymer or tripolymer tread rubber can be developed, the whole issue of natural *versus* synthetic becomes wholly academic because the industry will use the new rubber regardless of the cheapness of natural rubber. *Such a development is definitely within the realm of possibility although it undoubtedly will not happen until the polymerization plants are in private hands.* Any such major improvements are not going to be unveiled by their discoverers as long as there is any chance that they will have to be thrown into the common patent pool.

Suppose this possibility does not come to pass? Suppose GR-S develops no property wherein it is vastly superior to natural rubber and consequently is not in demand unless its price is made artificially attractive by tariff or subsidy, or its use required by continued government control? What will then happen?

Will the doors of the synthetic rubber plants and the butadiene and styrene plants be locked? Will the plants then rust and fall into a state of disrepair beyond remedy as Muscle Shoals is reputed to have done after the last war? Will mice build nests in the reactors, and robins roost in the purification towers?

This misapprehension is common among those who favor continued protection for the synthetic rubber industry, and this group apparently includes the Army and the Navy. In order to allay the fears of these people one point should be made very clear. It is this: The great bulk of synthetic rubber production equipment is not going to lie idle and fall apart from disuse unless shored up with government props.

Use of Present Synthetic Equipment

The greater part of this equipment is employed in the production and purification of the two chief raw materials—butadiene and styrene. Once these materials are made, their conversion into GR-S is relatively easy and is accomplished in comparatively simple equipment.

If there is no demand for butadiene to make GR-S, once natural rubber is freely available without restriction of any sort, then the butadiene plants will be used for production of other essential hydrocarbons. For example, the many plants which now start with butane gas and dehydrogenate it to butene will continue to do so. But instead of further dehydrogenation to butadiene the resulting butene will simply be alkylated to high-octane motor fuel. There need be little worry about the butadiene plants lying idle.

And what will happen to the styrene plants? They will continue to make styrene. Styrene is easily polymerized into an ivory-like plastic which is not only beautiful, but also tough and utilitarian. This plastic, polystyrene, is easily worked, has excellent mechanical properties, and exceptional dielectric properties which recommend its employment for many electrical uses and particularly as insulation in coaxial cables for conducting high-frequency currents. Polystyrene is sure to find widespread use in the Wonderful World of Tomorrow about which the advertising men talk so ecstatically.

GR-S Production When Required

If the time ever comes when we need full production of GR-S due either to our being shut off from the sources of natural rubber or to a foreign producer trying to exact too high a price for it, the butadiene and styrene plants can begin speedy production of the needed raw materials. As stated above, once the raw materials are available, their conversion into GR-S is relatively simple. Copolymer plants could be constructed quickly or, if it is thought more desirable, part or all of the present plants can be placed in stand-by condition. Equipment in the polymerization plants is basically simple and could be effectively "canned" with little difficulty.

[1] Reprinted from "Lockwood's Rubber Report," July 15, 1947.
[2] Technical director, Harwick Standard Chemical Co., Akron, O.

As stated by Dr. Palmer in the May *Rubber Report*, means should be provided first to lease or sell any of the polymerization plants to private industry if they are to be used to produce GR-S or improved types of general purpose synthetic rubber. Remaining plants could then be placed in stand-by condition.

Not only is it unnecessary to protect the synthetic rubber industry, as explained above, but there are several definite objections to such protection.

Objections to Government Protection of Synthetic

First, protection which results in lack of competition stifles development because there is no need to improve the protected product or develop cheaper and better methods for its protection. Development springs from the hottest kind of competition, the kind that the synthetic industry will have if natural rubber can enter this country at any price it pleases. If we protect the present synthetic rubber industry, we will be protecting obsolescense instead of encouraging growth.

A *second* objection is that the public might not receive top-quality products if the rubber goods manufacturing industry is compelled by economic pressure of any sort to use GR-S. Synthetic rubber is excellently suited for some purposes. It is definitely less desirable than natural rubber for other purposes. If its price is made more attractive than that of natural rubber through artificial means, it will be used both where it is suitable and where it is not quite so good.

Third, and most important, restrictions of any sort are contrary to the policies of freer international exchange of goods to which this country is committed.

An argument frequently advanced for the protection of synthetic rubber by tariff or subsidy is that if this is not done and the industry dies out, producers of natural rubber will then be in position to gouge consumers in this country. It should be remembered that the opposite can happen, too. That is, if synthetic is protected, its producers may price it just as high as the traffic will bear. An excellent example of this occurred last year when the price of Butyl rubber was raised from 16½ to 18½¢ even though the material was being produced at a profit at the lower price. It is true that the Butyl plants were being operated by the government rather than by private industry when this increase was made. However the company operating the plant for the government certainly condoned the price rise even if it did not openly support it.

Summary

To summarize, natural and synthetic rubber should be permitted to compete with each other on merit and cost. Neither should be given any artificial advantage. This competition will stimulate development of better and cheaper synthetics. While this is coming to pass, there need be no fear of natural rubber prices getting out of hand. The threat of potential synthetic production will prevent this condition from arising even though not a single pound of synthetic is actually being produced. The synthetic plants do not necessarily need to continue producing synthetic in order to exercise this stabilizing influence on crude rubber prices. Being comparatively simple, the synthetic plants can readily be placed in standby condition. "Canning" does not need to be considered for the much more complicated plants which produce the raw materials for synthetic rubber. These plants will unquestionably continue in operation, perhaps producing other hydrocarbons, but always ready to make synthetic rubber raw materials if it is ever necessary to combat an attempted price gouge by natural rubber producers or to supply the needs of the country if ever again cut off from sources of natural rubber.

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smallholders in name only, and probably were not even smallholders in the statistical sense. The figure of 50,956 acres newly planted in 1939-40 almost certainly includes some new planting by Chinese and Chettiar owners of over 100 acres. It very probably also comprises a considerable area of "supplying" (the planting of a few trees on vacant patches within the existing holding), which was freely permitted under restriction and should not have been included in new planting. There may also be other sources of error. New planting by smallholders was thus very probably less than 51,000 acres, or 4% of their 1938 acreage. It was, of course, nowhere near 100,000 acres as would be suggested at first sight by the change in the smallholdings' area from 1,264,678 acres at the end of 1938 to 1,361,128 acres at the end of 1940 shown in the "Malayan Rubber Statistics Handbook." Even if the figures of 51,000 acres of new planting by smallholders were accurate, it would still be misleading since the Malays and the smaller Chinese holders hardly undertook any new planting. This fact is masked in the statistics of total planting by smallholders, but emerges clearly from the figures of applications for new plantings of five acres or less, given earlier in this paragraph.

The failure of the Malay and of the smaller Chinese owners to use the new planting rights was due to several reasons, one of which was of overriding importance. The planting rights, issued in the form of transferable "share certificates" in denominations and multiples of one-twentieth of an acre, entitled the owner to plant rubber to the extent of 5% of his 1938 registered acreage. Thus an owner of three acres would be entitled to plant about one-seventh of an acre; while the owner of a five-acre holding was entitled to plant one-quarter of an acre. These very small areas were whittled down considerably by a remarkable ruling of the restriction authorities by which one-twentieth of an acre was declared to be the equivalent of eight trees, so that one certificate, or unit, entitled the owner to plant eight trees. It is not clear whether this ruling applied throughout Malaya, but it was certainly in force over considerable areas. As the smallholders usually plant between 200 to 300 trees per acre, this arbitrary ruling, based on past estate practice (planting is now much denser on estates than it used to be) reduced even further the fractional area the smallholders were entitled to plant.

After the receipt of the share certificates, owners who had no unplanted reserve land (these were the great majority) had to apply to the land offices for the alienation of land on which to carry out new planting. The amounts involved were so small as hardly to make worth while a visit to the land offices (often from smallholdings 15 to 20 miles away), and far too small to be worth carrying out new planting any distance from the existing holding of the owner. A smallholder is often prepared to operate a three- or four-acre holding a mile or two away from his house, but he cannot be expected to go far afield to tap or plant 16, 24, or 32 trees. Moreover, if these trees are any distance from his existing holding, it would not be practicable to tap these, as the time lost in walking from one holding to the other (com-

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Ricinoleate Esters as Low-Temperature Plasticizers for Nitrile-Type Synthetics

T. C. Patton[1] and M. K. Smith[2]

THE butadiene-acrylonitrile copolymers are subject to stiffening when subjected to low-temperature conditions. In overcoming this deficiency, recourse is commonly made to plasticizers capable of imparting satisfactory low-temperature flexibility properties to the cured stocks. Crossley and Cashion[2] state that where resistance to stiffening at low temperature is of primary importance, ester-type softeners are ordinarily used. They cite dibutyl sebacate and tributoxy ethyl phosphate as suitable plasticizers for low-temperature use. Morris, Hollister, and Seegman[3] state that the cold resistance of vulcanizates compounded from nitrile-type copolymers can be greatly improved by the inclusion of certain esters or ethers in the formulation recipe. With emphasis placed on low-temperature characteristics, they picked tributoxy ethyl phosphate and Plasticizer SC in that order as plasticizers most satisfactory for Perbunan 26.

The B. F. Goodrich Chemical Co.[4] states that the plasticizer is by far the most important single factor in obtaining low-temperature flexibility and that the best low-temperature flexibility is usually achieved with a combination of two or three plasticizers of the ester type.

Dibutyl sebacate, tributoxy ethyl phosphate, and Plasticizer SC are suggested as samples of softeners or plasticizers for use. From these references it becomes apparent that: (1) ester-type plasticizers are indicated for conferring low-temperature flexibility to nitrile type copolymers; and (2) of the commercially available esters, dibutyl sebacate, tributoxy ethyl phoshate, and Plasticizer SC are rated as eminently satisfactory for imparting good low-temperature performance.

It is the object of this article to show that esters derived from ricinoleic acid should also be included in this small select group of plasticizers capable of conferring outstanding flexibility to nitrile-type vulcanizates at low temperatures.

[1] Baker Castor Oil Co., Bayonne, N. J.
[2] Rubber Age, (N. Y.), 58, 197 (1945).
[3] *Ibid.*, 56, 163 (1944).
[4] Hycar Blue Book, B. F. Goodrich Chemical Co., Cleveland (1944).

TABLE 1. PROPERTIES OF NITRILE-TYPE RUBBERS WITH VARIOUS LOW-TEMPERATURE PLASTICIZERS

Study B1
Formulation

Perbunan 26	100.0
Zinc oxide	5.0
MPC Black	50.0
Stearic acid	1.0
Benzothiazyl disulfide	1.0
Sulfur	2.0
Plasticizer	20.0

Cure 60 minutes at 306° F. B_1 data

Physical Tests (at Optimum Cure)

	Methyl Ricinoleate	Methyl Acetyl Ricinoleate	Butyl Acetyl Ricinoleate	Modified Butyl Acetyl Ricinoleate	Plasticizer SC	Dibutyl Phthalate	Tricresyl Phosphate
300% modulus (p.s.i.)	800	850	850	750	1100	1200	1250
Tensile (p.s.i.)	2000	1700	1800	1700	1300	1400	2200
Elongation (%)	520	450	510	590	400	360	450
Hardness (Shore)	60	59	60	62	65	66	65
Flexibility limit	—85	—80	—80	—80	—70	—55	—40

Study B2
Formulation

Hycar OR-15	100.0
Zinc oxide	5.0
MPC black	50.0
Stearic acid	.5
Benzothiazyl disulfide	1.5
Sulfur	1.5
Plasticizer	20.0

Cure 60 minutes at 306° F. B_2 data

Physical Tests (at Optimum Cure)

	Tributoxy Ethyl Phosphate	Modified Butyl Acetyl Ricinoleate	Plasticizer SC	Methyl Acetyl Ricinoleate	Dibutyl Phthalate	Tricresyl Phosphate	Methyl Ricinoleate	Butyl Acetyl Ricinoleate
300% modulus (p.s.i.)	1600	800	1400	1600	1000	1900	900	1100
Tensile (p.s.i.)	2000	2500	2700	2600	2300	2500	3000	2200
Elongation (%)	380	600	480	370	550	400	570	510
Hardness (Shore)	65	60	64	61	62	73	66	64
Flexibility limit (°F.)	—55	—50	—50	—30	—30	—20	—15	—15

Experimental Details

The experimental data submitted here to support this contention have been drawn from three sources, the rubber laboratory of the Baker Castor Oil Co. and two independent industrial laboratories. The latter data have been taken in part from unpublished material submitted in private communications to the author.

The Baker Castor Oil data compares the low-temperature flexibility effectiveness of several ricinoleate derivatives with Plasticizer SC, dibutyl phthalate, tributoxy ethyl phosphate, and tricresyl phosphate in Hycar OR-15; with Plasticizer SC, tricresyl phosphate, and dibutyl phthalate in Perbunan 26. Study B1 and B2 in Table 1 give the compounding formulations used and the physical tests obtained with these synthetic-rubber vulcanizates. Four curing periods were investigated. Values obtained at optimum cure times were used in compiling the physical test results.

In the low-temperature flex test, the temperature flexibility limit was taken as the temperature at which a strip of the test material (6 inches by 0.083-inch by 0.25-inch), coiled into a 1¼-inch circle, first exhibited marked stiffness. Stiffness was gaged by squeezing the loop. Additional work done on these particular compounds showed all of them to have good overall qualities for general use.

Inspection of the test results reveals the effectiveness of the ricinoleate esters in imparting good low-temperature properties to nitrile-type synthetics. They compare favorably with the other low-temperature esters in the fact that their effectiveness increases as the nitrile content of the rubber is lowered.

TABLE 2. PROPERTIES OF BUTAPRENE WITH VARIOUS LOW-TEMPERATURE PLASTIZERS

Study X1

Formulation

Butaprene NF	100.0
Polymerized trimethyl dihydroquinoline	2.0
SRF Black	77.0
Zinc oxide	3.0
Sulfur	2.5
Benzothiazyl disulfide	1.0
Plasticizer	14.5

Cure 30 minutes at 312° F.

Physical Tests

	Tributoxy Ethyl Phosphate	Methyl Ricinoleate
300% modulus (p.s.i.)	1650	1295
Tensile strength (p.s.i.)	1750	1730
Elongation (%)	310	405
Hardness (Shore)	60	58
Bent loop (5 hrs. % —70° F.)	OK	OK
Temperature to reach Young's modulus of 104 p.s.i. (°F.)	—41	—38
Shape of curve	(Practically identical)	
Apparent crystallization	(None observed)	

*ASTM D736-46T.

Study X2

Formulation

Butaprene NXM	100.0
Polymerized trimethyl dihydroquinoline	2.0
SRF Black	32.0
FT Black	32.0
Zinc oxide	5.0
Stearic acid	1.0
Sulfur	2.0
Benzothiazyl disulfide	1.0
Plasticizer	25.0

Cure 20 minutes at 312° F.

Physical Tests

	Dibutyl Sebacate	Methyl Ricinoleate	Dibutyl Phthalate
300% modulus (p.s.i.)	320	180	440
Tensile strength (p.s.i.)	1820	1650	2000
Elongation (%)	750	835	730
Hardness (Shore)	40	39	45
Brittle point ASTM D746-44T)			
Good (°F.)	—40	—36	—18
Broke (°F.)	—42	—38	—20

Data from one of the industrial laboratories, comparing the effectiveness of methyl ricinoleate with tributoxy ethyl phosphate in a Butaprene NF and with dibutyl sebacate and dibutyl phthalate in a Butaprene NXM are given Table 2, Study X1 and X2. From these data it can be seen that methyl ricinoleate is a fully acceptable plasticizer of the low-temperature class along with dibutyl sebacate, tributoxy ethyl phosphate, and Plasticizer SC.

Information abstracted from a second industrial organization report is tabulated Table 3, Study H1. These data afford a comparison of methyl ricinoleate with four ester-type plasticizers specifically recommended for imparting low temperature flexibility to Hycar OR-25. In this particular instance, methyl ricinoleate proves to be superior to these reference esters, which have been accepted in the past as providing lowest temperature flexibility.

Conclusions

From a survey of these data from several sources, it becomes evident that the ricinoleates comprise an ester group from which can be obtained plasticizers which are highly effective for inducing good low-temperature flexibility to the nitrile-type rubbers, matching the performance of the best plasticizers which have been utilized to date for this purpose.

TABLE 3. PROPERTIES OF HYCAR OR-25 WITH VARIOUS PLASTICIZERS

Study H1

Formulation

Hycar OR-25	100.0
Zinc oxide	5.0
Stearic acid	1.0
Sulfur	1.5
SRF Black	60.0
Benzothiazyl disulfide	1.5
Plasticizer	30.0

Physical Tests (at Optimum Cure)

	Methyl Ricinoleate	Tributoxy Ethyl Phosphate	Plasticizer SC	Dibutyl Sebacate	Dibutyl Phthalate
300% stress or modulus (p.s.i.)	950	1010	1100	1250	1225
Tensile (p.s.i.)	1500	1825	1825	1800	1990
Elongation (%)	600	435	415	395	430
Hardness (Shore)	41	46	45	45	48
ASTM freeze test (bent loop)					
Pass (°F.)	—70	—60	—60	—60	—50
Fail (°F.)	—80	—80	—70	—70	—60

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prising a few trees only) would be prohibitive. Thus this fractional acreage of new planting was of no value to the individual smallholder unless he had unplanted reserve land, or there was unalienated land available bordering on his own holding where he could secure a small plot for planting. Moreover only those areas could be of use where the few young trees would not suffer from shading or root competition. It was wholly exceptional for these unusual conditions to be fulfilled simultaneously. New planting by the great majority of the smallholders was thus ruled out. Most smallholders who understood the purpose of the certificates therefore sold these or gave them to friends or relatives who might have been in a position to use them.

The bulk of the small acreage which according to the official statistics was newly planted by smallholders in 1939-40 was taken up by owners of small estates or of medium holdings of 30-100 acres each and not by resident owners or peasant proprietors with holdings of a few acres each. The figures already quoted of applications for new planting of five acres or less in 1939[10] show that these totaled less than 17,000 acres, or less than 1½% of the smallholdings area, and probably less than 2% of the acreage of holdings of resident owners. The total number of applications was 8,420, of which 3,033 came from Malays. The average new planting of individual Malay owners was certainly smaller than that of the Chinese or Indian owners, and this fact would suggest that the aggregate of Malay applications for new planting in 1939 was almost certainly less than 8,000 acres. The total Malay-owned smallholdings area is of the order of 600,000-700,000 acres. It is doubtful whether the Malays and the resident Chinese owners newly planted as much as 1% of their 1938 acreage over these years, and it is certain that the figure was less than 2½%. For all holdings under 100 acres new planting in 1939-40 was probably between 3% and 4% of the 1938 acreage.

(To be concluded)

[10] There was scarcely any new planting on smallholdings in 1940; over nine-tenths of the new planting of 1939-40 on smallholdings took place in 1939.

EDITORIALS

Realism in Rubber

THE formulation of a long-term national rubber policy may became stalemated unless the widely divergent views of different branches of the government as well as those of the rubber goods industry are reconciled in the course of the next several months. At the present time the executive branch of the government, as represented by the Army-Navy Munitions Board, is recommending long-term legislation on rubber that is not in accordance with the ideas on such legislation held by the House Armed Services Subcommittee on Rubber under Rep. Paul Shafer. At the same time the industry, as represented on the Industry Advisory Committee of the Army-Navy Munitions Board, is opposed to the legislation proposed by the Board and is apparently angry because industry recommendations were not included in the proposed bill. Representative Shafer, in a published statement, deplored the failure of government officials on the ANMB to embody important legislative recommendations of the rubber industry in the bill, adding that since the industry must live with such legislation, the industry should be satisfied with it.

The ANMB bill, which would require the mandatory use of about 300,000 long tons of synthetic rubber a year and would establish a new government agency to administer the policy, is objected to by industry because it would create a new agency to regulate controls over the consumption of rubber, and industry also opposes, at present, a program that does not terminate in a short period of time. Ralph F. Wolf, in an article in this issue of India RUBBER WORLD, takes the position that natural and synthetic rubber should be permitted to compete with each other on merit and cost without artificial advantage being given either type of rubber. In last Month's issue we presented the views of W. J. Sears, who argued that synthetic rubber (GR-S and possibly Butyl) would not be consumed substantially on a voluntary basis when natural rubber is freely available.

Obviously, a compromise solution about midway between the most extreme views will have to be worked out. It is unlikely that a new and bigger National Rubber Council, as recommended in the ANMB bill, or the complete elimination of all government controls over the rubber goods industry, will be the final policy decided upon. Mr. Wolf, in the above-mentioned article, emphasizes a point that has been repeatedly brought out in this column which we think, if settled at an early date, would facilitate the disposal of the government synthetic rubber plants and would greatly increase the chances for voluntary consumption of appreciable quantities of GR-S-type rubber. It is the matter of the common patent pool on synthetic rubber developments, which is retarding the production of new and better general-purpose synthetic rubbers, and, as Mr. Wolf points out, "any such major developments are not going to be unveiled by their discoverers as long as there is any chance that they will have to be in the common patent pool."

It has been a source of constant amazement to the editor of India RUBBER WORLD that the government in all its considerations of national rubber policy and disposal of synthetic rubber plants has attached only minor significance to this matter of the elimination of the common patent pool. Actually, the existence of this patent pool is probably doing more than any other single item to retard the commercial development of better grades of general-purpose synthetic rubber and the disposal of the government plants. In connection with the latter, the insistence of the Reconstruction Finance Corp. in continuing its policy of paying more than once for the wartime cost of the plants by repeated amortization has kept the emphasis on the need of disposal or lease of these plants at a higher than necessary figure, with the consequent discouragement to private buyers.

Then there is the policy of maintaining the price of government synthetic rubbers, particularly GR-S and Butyl, at a figure 3¢ or 4¢ a pound higher than the present market price for natural rubber. With a guaranteed market by virtue of Rubber Order R-1, RFC does not have to meet the free market competition of natural rubber now, but by this procedure is unnecessarily antagonizing the consuming industry and is delaying for too long the time when government or private synthetic plant operators can establish at what cost per pound figure they can compete with natural rubber. There is considerable evidence that the manufacturers of some types of rubber goods would continue to use substantial amounts of GR-S voluntarily even when natural rubber is available in surplus, but they will not be able to afford to use GR-S if they have to do so at a price high enough to maintain the high-cost synthetic producers and enable RFC to make a profit on its synthetic rubber operations. The Canadian Government has taken a more realistic attitude in this situation by recently lowering the price of GR-S to 16½¢ a pound.

It might be that much better progress in the formulation of our long-term rubber policy by Congress during the next several months would be made if the industry and government personnel concerned would adopt an attitude of more complete "realism in rubber."

Another Wage Increase Necessary?

THE United Rubber Workers of America (CIO) should give serious consideration to the following extract from President Truman's Second Economic Report before continuing with its demand for another wage increase:

"With the wage adjustments already made . . . it follows that the patterns of workable price relations ultimately arrived at will be on a somewhat higher price level. . . However, this is not a justification for pyramiding wage-price increases or failing to make price reductions whenever and wherever possible."

Scientific and Technical Activities

A. C. S. Division of Rubber Chemistry, New York Meeting

THE Division of Rubber Chemistry of the American Chemical Society will hold its fall meeting in New York, N. Y., on September 17, 18, and 19, with headquarters at the Hotel Commodore. These meeting days coincide with the latter part of the A. C. S. meeting in New York. The headquarters hotel for the parent society will be the Pennsylvania.

Simon Collier, of Johns-Manville Co. and chairman of the New York Rubber Group, is chairman in charge of the local committee on arrangements for the Rubber Division. E. S. Kern, of R. T. Vanderbilt Co., Inc., is in charge of housing and the banquet and will be assisted in his work by I. E. Lightbown, of Enjay Co., J. Mack, of Advance Solvents & Chemical Co., and B. B. Wilson, of India RUBBER WORLD. Registration is under Peter P. Muraski, of E. I. du Pont de Nemours & Co., Inc., assisted by P. P. Pinto, of *Rubber Age*, G. N. Vacca, of Bell Telephone Laboratories, E. H. Krismann, of du Pont, and K. J. Soule, of Manhattan Rubber Mfg. Division, Raybestos-Manhattan, Inc.

George Wyrough, of Phillips Petroleum Co., and J. E. Waters, of General Cable Corp., are in charge of information. H. E. Jones, of American Hard Rubber Co., will head the committee on hospitality. Jean Nesbit, of U. S. Rubber Reclaiming Co., is treasurer and will be assisted by R. H. Walcott, of Stauffer Chemical Co. Meeting arrangements will be cared for by George Lawson, of Sharples Chemicals, Inc. J. M. Hamilton, of Binney & Smith Co., is chairman of the committee arranging for the suppliers' cocktail party; he will be assisted by E. B. Curtis, of R. T. Vanderbilt, W. J. Geldard, of Naugatuck Chemical, B. R. Silver, of N. J. Zinc Co., and T. J. Starkie, of Witco Chemical Co. Publicity will be handled by R. G. Seaman, of India RUBBER WORLD, and M. E. Lerner, of *Rubber Age*.

The banquet of the Division will be held at the Hotel Commodore on the evening of September 18. Tickets for the banquet may be obtained from E. S. Kern, R. T. Vanderbilt Co., Inc., 230 Park Ave., New York 17, N. Y. Banquet announcements will be mailed to the membership approximately three weeks before the meeting, and requests for tickets should not be made until after receipt of the announcement. Tickets will also be available at the registration desk in the Hotel Commodore. The tickets are priced at $7 each.

As initiated at the Cleveland meeting, a suppliers' cooperative cocktail party will be held before the banquet. The committee in charge is profiting by the experience gained at the Cleveland meeting and promises that this cocktail party will be the best in the history of the Division.

The morning of September 17 has been set aside for registration. The technical sessions will begin at 1:45 p.m. on that day, with opening remarks by Division Chairman W. W. Vogt, of Goodyear Tire & Rubber Co. The first paper will be presented at 2:00 p.m. on September 17, and the technical sessions will continue on September 18, beginning at 9:00 a.m. and again at 2:00 p.m., and will conclude with a session on September 19, beginning at 9:00 a.m. Abstracts of the papers to be presented are given below.

The regular business meeting of the Division will be held the afternoon of September 17 and will include election of officers for the coming year. The meeting will start at about 4:10 p.m., being scheduled between the seventh and eighth papers presented during the afternoon technical session.

Abstracts of Papers

WEDNESDAY AFTERNOON—SEPTEMBER 17

Emulsion Polymerization of Isobutylene at Low Temperatures.[1] Emulsion polymerization offers advantages over bulk polymerization in that its rate is more easily controlled, localized superheating is prevented, and the quality of the copolymer obtained is often better and more uniform. Thus far, however, emulsion polymerization of hydrocarbons has been limited to aqueous systems and hence to temperature ranges above the freezing point of water. In seeking to apply the emulsion technique to the preparation of Butyl (GR-I) rubbers at low temperatures (—70° or below) we have recognized the primary need of a solvent possessing all the following characteristics: (1) m.p. —70° or below, (2) non-reactivity with polymerization catalysts (e.g., aluminum chloride or boron trifluoride), and (3) essential immiscibility with the hydrocarbon monomers at the temperature of polymerization. Until recently a solvent meeting all these qualifications had not been available, but the wartime development of highly fluorinated organic liquids, especially the fluorocarbons, has made it possible to investigate and report on the emulsion polymerization of isobutylene-butadiene mixtures at low temperatures.

Emulsion polymerization of isobutylene and emulsion copolymerization of isobutylene-butadiene mixtures at low temperatures have been achieved with the aid of fluorocarbon liquids as dispersing media. Butyl rubbers obtained from the products of this process gave satisfactory physical tests. These preliminary experiments indicate the usefulness of liquid fluorocarbons as inert dispersing media for reactions involving unusual conditions. G. Bryant Bachman and H. B. Hass, both of Purdue University, Lafayette, Ind., and E. J. Kahler, Battelle Memorial Institute, Columbus, O.

Low-Water Absorption Copolymers of the Non-Staining, Superior Processing Type. A paper[2] presented in September, 1946, described the development, manufacture, and use of GR-S-65, a low-water absorption copolymer designed for wire and cable insulation. This material was shown to possess electrical properties superior to those of GR-S types in production at that time.

Since then, responding to the growing demand for a non-staining GR-S and for non-staining processing aids for both GR-S and natural rubber, two new copolymers have been designed, developed, and produced. Evaluations by these laboratories and by the trade have furnished data supporting their special value as improvements over standard GR-S and GR-S-65.

The first of these two new materials, designated X-392 SP, varies from standard GR-S in that (1) acid-glue coagulation is used to minimize water-solubles and improve electrical stability; and (2) a new non-staining, non-discoloring stabilizer is substituted for the conventional antioxidant.

The other new material is called X-393 SP and varies from standard GR-S in the above two features, but in addition contains a controlled amount of "built-in" gel obtained by the use of a "crosslinking" agent. This copolymer possesses extremely good processing properties and is used in blends with rubber, GR-S, GR-S-65, or X-392 SP to obtain the balance of processing and physical properties required for a given process and product.

While X-392 SP and X-393 SP were outgrowths of the development of GR-S-65 and GR-S-60, their use is not limited to wire and cable insulation. Wherever non-staining, low water absorbing, or superior processing qualities are important, the above two new materials can be beneficially used. For example, present applications include fabric coating, molded mechanical goods, and natural rubber footwear compounds.

Evaluation data and descriptions of the processes are given. L. H. Howland, J. C. Madigan, E. R. Burns, and C. V. Bawn, all of United States Rubber Co., Naugatuck, Conn.

Geon Polyblend. Compatibility with vinyl resins is a characteristic of nitrile-type polymers which has enabled them to be used with vinyl plastics. There has been a need of a vinyl plastic containing such a rubber as the sole plasticizer for applications where conventional plasticizers cause these plastics to fail owing to extraction, evaporation, or migration. Geon Polyblend is such a plastic.

This new material is a colloidal dispersion of Geon resin with a Hycar rubber. It is free from nerve and at normal plastic operating temperatures fluxes readily while retaining the necessary flexibility and mobility for fabricating processes. Geon Polyblend can be used (1) as a thermoplastic material by fluxing the Geon Polyblend at temperatures of 280 to 350° F., in which case the Hycar polymer becomes the plasticizer for the Geon resin; (2) as a rubber polymer by mixing the Geon Polyblend on a cold mill and curing the Hycar portion of the Geon Polyblend, in which case the Geon resin becomes the reinforcing pigment; and (3) as a material for mixing either with vinyl plastic stocks as an extender, or with rubber stocks to improve their resistance to ozone, sunlight, solvents, and abrasion. In view of the above, Geon Polyblend is worthy of study as a new basic raw material.

To date, Geon Polyblend has only about 30% the light stability of a comparable vinyl plastic. However it can be measurably improved by compounding with pigments which reflect or absorb light. A complete range of colors, including brilliant pastels, is obtainable. Besides being adaptable to the usual hot processing techniques, Geon Polyblend can also be used in high solids content solutions. J. W. Perloff and G. W. Flanagan, both of B. F. Goodrich Chemical Co., Cleveland, O.

Cured Synthetic Elastomer-Polyvinyl

[1] Work done at Purdue University.
[2] India RUBBER WORLD, Aug., 1946, p. 668.

Resin Blends. Special techniques are presented on compounding and curing of butadiene-acrylonitrile type of copolymers with high molecular weight polyvinyl chloride polymers and vinylidene chloride polymers. The butadiene-acrylonitrile copolymers as well as butadiene-methacrylonitrile copolymer studied as vinyl resin plasticizers varied in molecular weight and nitrile content. Some of the rubber-like copolymers used are known commercially as Perbunan NS 26 and Perbunan 35 NS-90.

In the experimental work about 70 synthetic elastomer-vinyl-type blends were made on a laboratory rubber mill and then cured under heat and pressure. The tests conducted on most of the compounds were as follows: modulus at 100% elongation, tensile strength, ultimate elongation, Shore durometer hardness, brittle temperature, specific gravity, weight loss, heat aging at 250° F., light aging, stiffness, and volume increase in A.S.T.M. Reference Fuels No. 1 and No. 2, A.S.T.M. Oil No. 3, and water.

It was found that the butadiene-acrylonitrile copolymers that contained 26 to 35% acrylonitrile formulated cured polyvinyl resin-rubber blends with higher tensile strength, higher 100% modulus, and greater ultimate elongation to break than rubbers with less acrylonitrile. However the above properties were found only when the final products contained from 13 to 25% rubber. At higher concentrations of nitrile rubber, the tensile values and modulus values for the cured rubber-resin blends were about the same. A number of the cured products had excellent thermal and light stability, toughness, and inertness.

Results indicate that certain precautions must be followed in temperature of mixing and in the selection of compounding ingredients for the rubber-resin blends, such as accelerators and plasticizers, in order to obtain these unique properties. D. W. Young, D. J. Buckley, R. G. Newberg, and L. B. Turner, all of Standard Oil Development Co., Elizabeth, N. J.

Plasticizers for Butadiene-Acrylonitrile Rubber. Various compounds containing nitrogen in the amide or imide form have been tested in synthetic rubber of the oil-resistant types, with the emphasis on the butadiene-acrylonitrile type. The Firestone plastometer has been used throughout in this work. Several new types of plasticizers have been discovered, such as the alkyl-N, N-dialkylcarbamates, wherein no sulfur is involved.

The effect of varying the structure in the various alkyl groups has been studied in some detail.

When the dialkyl acetamides were being investigated the N, N-diisopropylacetamide proved a chemical curiosity. Diisopropylammonium acetate would not dehydrate but distilled undecomposed. The corresponding amide, however, had a strong camphor-like odor. The mono- and dialkylamides of mono- and dibasic acids are very effective plasticizers in Hycar OR.

The alkyl and hydroxyalkyl imides proved very effective plasticizers. The various phthalimides were of interest, with the non-cyclic acid, succinic acid, producing imides of even more value than the corresponding amides.

A method of preparing various mixed amides from succinimide has been discovered.

The esters of hydroxymethyl oxazolines are very effective plasticizers. These materials are prepared from the nitroparaffins through a series of reactions. Arthur Wm. Campbell and Philip F. Tryon, both of Commercial Solvents Corp., Terre Haute, Ind.

Properties of Lactoprene EV Elastomer. Effect of Plasticizers. In a study of plasticized Lactoprene EV[3] compositions the following plasticizers, listed in order of decreasing efficiency, were found most effective for lowering the brittle point: "Thiokol" TP-90B,[4] "Thiokol" TP-95, Flexol 4GO, butoxyethyl, diglycol carbonate, Flexol 3GH, and Flexol CS-24. These are all solvent plasticizers of the polyether formal or ether-ester type. Nonsolvent plasticization (blending with certain other synthetic elastomers) and internal plasticization (copolymerizing with higher n-alkyl acrylates) were also studied. Relations between resilience, swelling in plasticizer, and brittle points were observed. W. C. Mast and C. H. Fisher, both of the Eastern Regional Research Laboratory,[5] Philadelphia, Pa.

Pliolite Latex 190 in Latex Compounding. This paper describes the use of Pliolite Latex 190, a highly stable water dispersion of a high styrene copolymer resin, in latex compounding. It has a solids content of approximately 30%, contains an antioxidant, and is stabilized so that it may be added to other latices. It imparts valuable reinforcing properties when added to natural and synthetic rubber latices. Its light color and low specific gravity, when dry, enable it to be used where darker and heavier reinforcing agents cannot be used. It can be used in the production of many items where stiffness is desired without losing the inherent toughness of rubber.

Pliolite Latex 190 was added in quantities of 0, 10, 15, and 20 parts to natural rubber latex. Neoprene Latex Type 571, GR-S Type III Latex (normal solids, and creamed), Chemigum Latex Type 101 (a butadiene-styrene copolymer), and Chemigum Latex Type 200 (a butadiene-acrylonitrile copolymer). Data and graphs are presented illustrating the effect upon stiffness, hardness, tensile strength, elongation, tear strength, permanent set, and water absorption of the above latices.

Pliolite Latex 190 imparts reinforcement to other latices as shown by increased stiffness, hardness, and tear resistance. The water absorption is improved, and in most instances the tensile strength is increased. The elongation is affected only slightly, but the permanent set is increased. J. A. Weatherford and F. J. Knapp, both of Goodyear, Akron, O.

Polymerization Inhibition and Stopping Agents. In emulsion polymerization systems for the copolymerization of butadiene and styrene, an optimum conversion of monomer to polymer exists beyond which the polymer becomes increasingly dry and lifeless. This change is associated with the formation of a cross-linked, insoluble polymer which does not readily break down upon milling. Since polymerization may occur after the charge has left the reactor and is being treated for the recovery of unreacted monomers, the addition of a polymerization inhibiter to the system at the optimum conversion has been found necessary. The most common stopping agent is hydroquinone; others which have found use are tetramethyl thiuram disulfide, sodium sulfide, and diphenol sulfide. The stopping action exerted by a compound may be the result of polymer chain termination and destruction of initiator, or chain termination alone. If the terminating effect is great enough, the solubility of the compound is unimportant; but for benzenoid compounds oxidizable to quinones, a certain extent of water solubility is desirable. E. F. Kluchesky and L. B. Wakefield, both of the Firestone Tire & Rubber Co., Akron.

Influence of Cloud Points of Coumarone-Indene Resins on Their Use in Rubber Compounding. Commercial coumarone-indene resins employed in typical stocks at varying concentration indicate that cloud point of the resin is an excellent index of the softening action of such resins in uncured stocks as measured by Williams plasticity of the uncured rubber. There is a critical cloud point at which no change of Williams plasticity occurs with change in resin concentration over a limited concentration range; this critical cloud point varies with the polymer used, increasing with the polarity of the polymers studied.

Hardness of the vulcanizates varies in a similar manner. The critical cloud point for hardness is lower than that for plasticity. It is suggested that this variation is due to variation in degree of dispersion of the resins, which varies with variation in cloud point. The lower critical cloud point for hardness of the vulcanizates reflects the decreasing solubility of the resin as the polymer is vulcanized.

Tensile properties of the vulcanizates vary widely with resin type, low cloud point resins, in general, giving higher tensile strength, greater elongation, and lower modulus. High cloud point resins change the character of the stress-strain diagram from that of a rubbery material toward that of the plastic state.

The resins used showed a marked cure-retarding effect in GR-S and natural rubber, but only very slight effect in a nitrile rubber. The retardation varied widely, being greatest for low cloud point resins. It is probable that this retardation is due to the unsaturation of the resins. The reason for the slight effect of the resins on the cure of the nitrile rubber is not apparent. Palmer B. Stickney, LaVerne E. Cheyney, and Paul O. Powers, all of Battelle Institute.

Thursday Morning—September 18

Improvements in Rubber Testing in the Government Synthetic Rubber Program. In the government synthetic rubber program, the standard deviation of testing rubber has been markedly reduced. The values of the standard deviations obtained at the beginning of the program in 1943 and 1944 were two to 15 times as large as those obtained at present. The degree of improvement in precision depended on the property being evaluated and the technique of the laboratory personnel.

The improvement in the precision of testing rubber resulted from (1) standardization and improvement of technique, (2) refinement of existing methods of test, and (3) development of improved methods of test. Each of these approaches is reviewed. Some of the new methods of test that have been developed are: (1) pyrolysis method for the determination of carbon black content of GR-S black mixtures, (2) ultra-violet absorption method for the determination of stabilizer content of rubber, (3) refractive index method for

[3] Lactoprene EV, now being made on pilot-plant scale by the University of Akron Government Laboratories, is a 95% ethyl acrylate-5% chloroethyl vinyl ether copolymer.

[4] The use or mention of particular brands of material should not be construed as an endorsement or recommendation of these brands over others not mentioned.

[5] One of the laboratories of the Bureau of Agricultural and Industrial Chemistry, Agricultural Research Administration, United States Department of Agriculture.

the determination of the bound styrene content of GR-S polymers, and (4) constant stress method for determining the stress-strain properties of rubber.

The results which have been realized in this program indicate that a high degree of precision can be obtained in the testing of rubber if care is taken to control test conditions. The attainment of such precision has been achieved without a significant increase in man-hours or equipment-cost. Robert D. Stiehler, National Bureau of Standards, and Richard W. Hackett, Office of Rubber Reserve, both of Washington, D. C.

A Convenient Method for Preparing Tread Stocks to Be Road Tested. A semi-laboratory method for building test tires with treads half control and half experimental stock is discussed. The tread stocks were mixed in the laboratory, and the half treads pressed into shape in a laboratory mold, as opposed to factory mixing and whole tread extrusion. The building and curing operations for the half and half treads were carried out in the factory as in the case of factory extruded whole treads.

The advantages of half and half test tires are multiple. Economy in materials consumed, man-hours and testing space, less variation in contruction, and testing convenience in scheduling in the factory are realized. Besides it is possible by using this method to evaluate polymers in actual road tests which would have been rejected on the basis of laboratory tests, thus allowing a better correlation of laboratory and road test data.

Road testing data on 6:00-16 half and half tires presented along with data on 9:00-20 whole tires show half and half tires give comparative wear ratings very similar to those obtained with whole tires for several special polymers. S. R. Harrison, Firestone.

A Study of Abrasion Resistance by a Modified Method. The abrasion resistance test of GR-S commercial recapping compounds, carried out according to the regular A.S.T.M. procedure, was found to give results which did not agree with road tests. This condition is due to the formation of a viscous film on the abrasive and on the abraided rubber surface which lubricates the abrasive and leads to a ridiculously low abrasion loss. Extraction of the vulcanized rubber, prior to abrasion, with ethanol-toluene azeotrope prevented the development of this film and brought about excellent correlation with road tests.

The contamination was not so apparent with footwear compounds as with tread compounds, but it was obvious from the results, although there were no road tests to confirm this conclusion, that footwear compounds often show a considerable error in the laboratory test, which can be corrected only by extraction.

Natural rubber showed the same error, but to a lesser extent than GR-S.

A study of this effect in various types of compounds led to the conclusion that softener in the compound contributes only in a minor way to the contamination, and that the main cause is probably depolymerized rubber developed during vulcanization.

Reasons are advanced for the theory that the rubber being abraded on the road is actually extracted rubber because extractible materials is probably wiped off on the road before appreciable abrasion occurs, and plays no direct role in the abrading process. T. R. Griffith, E. B. Storey, J. W. D. Barkley, and F. M. McGilvray, all of National Research Council, Ottawa, Ont., Canada.

Measurement of Resistivity in Conductive Rubbers. The measurement of resistivity of conductive rubbers is affected by the compounding ingredients, the distribution of these ingredients, the amount of flexing, electrode contact resistance, the relative humidity, the temperature and the age of the sample.

The type of carbon has the greatest influence on conductivity as the crystalline type, such as acetylene black, imparts conductivity to a marked degree. The channel blacks of smaller particle size also impart conductivity, but this property changes only slightly on loading. Milling or mixing for better distribution decreases conductivity when acetylene blacks are used, but has little effect on channel black stocks.

A method of measuring the volume resistivity that eliminates the high electrode contact resistance of other methods consists of measuring the potential drop along a portion of the sample while a current is passing through the sample. This involves using a double electrode system with two separate circuits, one a current circuit, and the other a potential or measuring circuit. The method is a combination of methods of National Fire Protective Association of Canada and the Goodrich company.

Using a heat treatment to eliminate the effect of flexing, storing in a desiccator, and testing at a standard temperature, the method gives results that may be used as an indication of relative value of compounds as conductors in actual service. Arthur C. Hanson, Rock Island Arsenal, Rock Island, Ill.

The Effect of Copper on the Accelerated Aging of Neoprene Compounds. The use of neoprene in direct contact with metallic copper wire is one of the new methods of construction being considered by the insulated wire industry. This paper presents preliminary observations on the effect of copper and copper compounds on the accelerated aging of neoprene vulcanizates and indicates that a neoprene stock can be compounded for successful use on bare copper wire, thus eliminating the necessity of using tinned wire in many applications.

The following specific conclusions are based on physical properties retained after aging in the 70° C. air oven and the 70° C. oxygen bomb.

1. Any neoprene compound should contain an antioxidant to insure good aging, and whenever contact or contamination with copper is anticipated, the use of an antioxidant is particularly important.

2. A neoprene insulation compound containing an antioxidant and extruded directly over a bare copper conductor deteriorates only slightly faster than it would if extruded on tin coated copper wire. If the compound is further protected by the addition of a copper inhibiter, aging characteristics over tinned or bare copper wire are essentially equal.

3. Supplementary work involving exposure of neoprene compounds to copper in other forms is in agreement with results on wire. This includes the effect of contact with copper dust and copper bearing alloys and also the effect of adding a neoprene-soluble copper compound, e.g., copper stearate, to the stock during mixing.

4. It is believed that the only mechanism by which metallic copper can affect the aging of neoprene is through its prior conversion to a neoprene-soluble form and that increasing concentrations of copper in this form accelerate the oxidation of the vulcanizate proportionally. L. R. Mayo, R. S. Griffin, and W. X. Keen, all of du Pont, Wilmington, Del.

Oxidation and Thermal Decomposition of Selected Elastomers in Air. Neoprene 1,3-butadiene-acrylonitrile copolymer, GR-S, and natural rubber vulcanizates undergo exothermic decomposition when rapidly heated to about 300° C. Various compounding agents may modify this reaction, but do not eliminate it. The intensity of the exothermic reaction of neoprene is increased by zinc and magnesium oxides, but decreased by MPC black. Higher temperature maxima result from increased heating rates. Polythene gives no exothermic reaction.

The exothermic reaction of all elastomer samples is preceded by the evolution of sufficient smoke to obscure visibility. Complete extinction occurs at a point between the beginning and the maximum intensity of the exothermic reaction. The natural rubber and GR-S samples give fluctuating smoke densities. The smoke density determinations were made with the aid of a standard sealed-beam headlight, a Weston light meter (Model 614), and a smoke chamber 22 inches in length.

The smoke from all elastomers is usually white. The neoprene samples compounded with zinc and magnesium oxides give a yellow to black smoke. This colored material, upon cooling, gradually condenses to a colored liquid leaving a white smoke.

The vapors from all of the elastomers flash when the metal container is rapidly heated to approximately 420° C. The vapor from neoprene is essentially noninflammable and extinguishes the pilot light. The vapor from the others flashes back to the sample which continues to burn.

The effects of heating below the exothermic decomposition temperature and the initiation of the exothermic reaction by intense local heating are also reported. Exothermic decomposition of neoprene is characterized by the copious evolution of hydrogen chloride, but very little is evolved prior to this. Phosgene was not found. Similarly the 1,3-butadiene-acrylonitrile copolymer gives hydrogen cyanide, and natural rubber gives saturated hydrocarbons. The theoretical implications are discussed. Glenn S. Skinner and James H. McNeal, both of University of Delaware, Newark, Del.

The Determination of Free Carbon in Compounded Rubber and Synthetic Elastomers. A literature survey fails to show a general method for the determination of carbon black in both natural rubber and all types of synthetic elastomers.

A.S.T.M. methods D297-46T for rubber and D833-46T for synthetic elastomers are not applicable to the determination of free carbon in Butyl rubber.

Published methods for the estimation of black in vulcanized Butyl rubber[6] and in Butyl rubber reclaim[7] are lengthy and limited in application.

The method proposed by this paper is rapid, accurate, and applicable to all types of vulcanized stocks, including Butyl rubber. In this method the sample is softened in boiling tetrachloroethane, and boiling nitric acid is added to decompose the elastomer. The cooled mixture is extracted with ether, leaving the nitric acid and black as a residual layer in the beaker. This layer is diluted with acetone or an acetone-ether mixture and poured into a Gooch crucible partly filled with ether.

[6] *Analyst*, 71, 505 (1946).
[7] *Ind. Eng. Chem. (Anal. Ed.)*, 18, 522 (1946).

The coagulated black is thoroughly washed, dried, weighed, ignited, and calculated in the usual manner.

Unique features of the method are the use of tetrachloroethane-nitric acid for the quick decomposition of the sample and the use of ether to coagulate the carbon black and permit its quick filtration.

Reproducibility using this method, even in the hands of different analysts inexperienced with the method, has been within ±0.5% on samples containing approximately 30% free carbon. George D. Louth, Firestone.

Vulcanization of Synthetic Rubbers by the Peachey Process. The Peachey process, which vulcanizes natural rubber by subjecting it alternately to vapors of sulfur dioxide and hydrogen sulfide, has been found to vulcanize the more common synthetic rubbers. The polymers studied were natural rubber, GR-S, GR-M, GR-I, GR-A, Hycar OR-25, Hycar OS-10, Hycar OS-20, and Hycar OS-30.

The rubbers tested were milled to thin sheets, and cut into small strips. These strips were placed on a screen gauze and inserted into a glass tube about three feet long having a triple inlet for admitting sulfur dioxide, hydrogen sulfide, and air. The vulcanizing gases were each passed slowly through the tube for five minutes, and each was followed by a brisk sweep of air for about ten seconds in order to remove the uncombined gases.

This cycle of operations was repeated a number of times on each of the polymers. In some cases as many as 128 cycles were performed. After exposure the samples were weighed to determine the total amount of sulfur added, qualitatively evaluated by hand stretching as to the state of cure, and finally some were quantitatively analyzed to determine the amounts of free and combined sulfur.

Good cures were obtained with all of the polymers except GR-M. None of the synthetic rubber cured any faster than natural rubber. The nitrile rubbers and the styrene rubbers cured at about the same rate or somewhat slower. GR-I required roughly 50 times as long as natural rubber for an equivalent cure; while GR-M required even longer. Norman Bekkedahl, Fred A. Quinn, Jr., and Elmer W. Zimmerman, all of National Bureau of Standards, Washington, D. C.

THURSDAY AFTERNOON—SEPTEMBER 18

Improved Processing GR-S by Variations in Compounding. A compounding study was made in an attempt to prepare a stock having the excellent processing properties of divinylbenzene cross-linked polymer (GR-S-60) and the stress-strain properties of standard GR-S. Investigation of Banbury mixing of stocks containing GR-S-60 and GR-S-60/GR-S blends indicated that mastication at high dump temperatures (in the vicinity of 380° F.) would seriously degrade both the processing and stress-strain properties of these compounds.

Banbury treatment of GR-S at 380° F. for five minutes in the presence of 0.5-part of sulfur, 1.5 parts of Captax, and 50 parts of carbon black, but prior to mixing with other materials, gave an easy processing stock superior to Banbury mixed GR-S-60 in both processing and stress-strain properties as judged by laboratory methods including the Garvey die extrusion test. In addition the processing properties of this compound very closely approached, and the stress-strain properties excelled those of GR-S-60 which was mixed on a mill at lower processing temperatures.

With other combinations of cross-linking agents, the best results were obtained from five-minute mixing at 380° F. with Amberol ST-137; Butyl Eight, sulfur, and Captax; Durez resin No. 12687 and Captax; Telloy or Vandex, zinc oxide, and sulfur; Ethyl Tuads; thio-beta-naphthol and sulfur; or Polyac.

Appiled on a commercial scale, this treatment would involve little, if any, additional processing in the preparation of tread stocks, and no new compounding materials would be required. The stock would be completely compounded and prepared for the extruders in a single Banbury cycle. R. A. Crawford, B. F. Goodrich Co., and G. J. Tiger, University of Akron, both of Akron.

The Role of Absorption in the Reinforcement of GR-S. The reinforcing properties of non-carbon pigments in natural rubber and GR-S are quite dissimilar. There is considerable compounding evidence that the surface activity of a pigment is important in determining its ability to strengthen GR-S; while in natural rubber the surface area of a pigment seems to have a more dominant influence on reinforcement than does its surface activity.

Previously reported experiments demonstrated that acetone extracted GR-S develops substantially better physical properties with non-carbon fillers than regular GR-S. These results suggested that the short-chain materials in GR-S were responsible for the inferior properties, and other methods of rendering these components ineffective were considered. More recent experiments have indicated that similar results can be achieved by compounding GR-S with surface pigments which adsorb some of the lower molecular weight material in GR-S. These observations are substantiated, at least in part, by experiments in which dilute solutions of GR-S are mixed with the pigments and the properties of the adsorbed and unadsorbed fractions of GR-S are evaluated after the pigment has been separated.

These data are presented with the thought that they might suggest further experiments leading to the development of improved synthetic elastomers. C. E. Barnett and H. C. Jones, both of N. J. Zinc, Palmerton, Pa.

Physical Properties of Fractions of GR-S and Their Vulcanizates. A large-scale precise fractionation of GR-S (X-55) was performed using the fractional precipitation technique at 25° C. Nine fractions, each weighing approximately 150 grams and comprising approximately 11% by weight of the original unfractionated sample, were obtained, and a detailed study was made showing the effect of number average molecular weight and related sol-gel properties on various physical and chemical properties of the crude and vulcanized fractions.

Using a Santocure tread-type recipe, preliminary compounding work indicated the sulfur ratios required to give vulcanizates with 300% modulus values of 1000 p.s.i. All fractions were recompounded using these indicated optimum sulfur values. Generally, as the number average molecular weight increased, better stress-strain and quality index data were obtained. These and other physical properties of the vulcanizates of these fractions are discussed in detail.

As found in past fractionation studies pertaining to unsaturated high polymers, the higher molecular weight fractions obtained from the unfractionated sample totally soluble in benzene undergo considerable gelation when isolated and vacuum dried at 25° C. in the dark. As the indicated molecular weight of the fraction increased, higher per cent gel contents were obtained. Compared to unfractionated butadiene-styrene copolymers of similar gel contents, the gel portions of the higher molecular weight fractions had unusually high swelling indices, indicating qualitatively that the average molecular weights between points of effective cross-linking in the three dimensional gel structure were higher than those encountered in the past in unfractionated samples of similar gel contents.

Using osmometric technique, the number average molecular weights of the benzene soluble portions of these fractions were determined, and the relation of $[\eta]_o$ to the number average molecular weight was determined.

Other data are given pertaining to these fractions, such as the bound styrene content, per cent shrinkage of the compounded unvulcanized stocks, and the rate of gel breakdown with cold milling. John A. Yanko, Goodrich.

Copolymers of Butadiene with Ring Chlorinated Isopropenyl Benzenes. The following chlorinated isopropenyl benzenes have been prepared: o-chloro, m-chloro, p-chloro, 2,3-dichloro, 2,4-dichloro, 3,4-dichloro, 3-5-dichloro. Laboratory methods used for their preparation are discussed. It has been found that, unlike the chlorinated styrenes, all of these materials are quite resistant to homopolymerization. They can therefore be handled with ease during their preparation and purification without difficulty from premature polymerization.

The mono- and dichloroisopropenylbenzenes which do not contain a chlorine group ortho to the isopropenyl group copolymerize in emulsion with butadiene to yield rubbery polymers having physical properties superior to those of GR-S. The polymerization recipes and the compounding recipes will be discussed along with the physical properties of the compounded rubbers as compared to those of alphamethylstyrene-butadiene and dichlorostyrene-butadiene rubbers, and GR-S.

Data concerning the rate of entry of the dichlorinated isopropenyl-benzenes into the polymer are given along with a refractive index method for determining the amounts of dichloroisopropenylbenzenes present in a butadiene copolymer. R. E. Metzger, G. Raymond, R. Rongone, Betty Sobel, G. H. Stempel, and K. Weinstock, all of General Tire & Rubber Co., Akron, and R. B. Cross, W. E. Hake, and W. Woodland, all of Carnegie Institute of Technology.

2-Benzothiazyl - N,N - Disubstituted Thiocarbamyl Sulfides as Vulcanization Accelerators. Benzothiazoles and thiuram sulfides represent two classes of vulcanization accelerators which have been widely and advantageously employed in the rubber industry for many years. The essential structure of each of these two classes of accelerators may be incorporated in a single molecular form, the simplest representatives of which are the 2-benzothiazyl-N,N-disubstituted thiocarbamyl sulfides. These have the structure represented by R-S-C-NR′R″, where R is a benzothiazyl group, and -NR′R″ is a secondary amino group. A compounding survey of this class of compounds has shown them to be powerful vulcanization accelerators exhibiting a desirable delayed action. Vulcanizates have been prepared with these materials in natural rubber, GR-S, GR-A, and GR-I.

The 2-benzothiazyl-N,N-disubstituted thiocarbamyl sulfides disperse readily in natural rubber and GR-S, where they function as primary self-activated accelerators. Small amounts afford effective vulcanization, producing vulcanizates with good stress-strain properties, tear and cut-growth resistance, and good aging characteristics.

A number of the 2-benzothiazyl-N,N-disubstituted thiocarbamyl sulfides, such as the N,N-dimethyl, -diethyl, -dibutyl, N-ethyl-N-phenyl, and N-cyclopentamethylene derivatives have been investigated in natural rubber and GR-S. The N,N-diethyl derivative, one of the most active of the group, has been more thoroughly studied in natural rubber, gum and tread stocks, as well as in GR-S tread stocks. Vulcanizates cured with 2-mercaptobenzothiazole and N-cyclohexyl-2-benzothiazyl sulfenamide have been included for comparative purposes. G. M. Wolf and C. C. de Hilster, both of Sharples Chemicals, Wyandotte, Mich.

Relationship of Rayon Tire Cord Dip Pick-up, Cord Adhesion, and Flex Life of Passenger Tires. Previous papers have attempted to show the effect of cord dip composition and amount of dip deposited upon adhesion between rayon cord and rubber stocks. Much emphasis has been placed upon adhesion value; however, this work is an attempt to show the relation between quantity of dip deposited, adhesion value and flex life in tires.

Two series of tire tests were run to determine the effect of GR-S Type III Latex and reclaimed rubber dispersion dips upon flex life of rayon tire cords. The performance of the tires upon wheel tests has shown a marked relation between adhesion, dip deposit, and tire life. The results have indicated that tire flex life is improved by lower dip pick-up even though cord adhesion values have been reduced. R. T. Murphy and L. M. Baker, both of Mansfield Tire & Rubber Co., Mansfield, O.

FRIDAY MORNING—SEPTEMBER 19

The Ultimate and Actual Tensile Strengths of Type III Latex Films. A comparative study was made of the tensile strengths of raw polymer and gum vulcanizate films prepared from 53 Type III GR-S latices. The ultimate tensile strengths of the two types of films showed no correlation with each other when the calculations were based on the original cross-sectional areas. On the other hand, when the calculations were made on the actual areas at break, the tensiles of the raw polymer and vulcanizate films obtained from a given latex were found to be essentially the same. This identity of film tensiles obtained from a given latex indicates that here compounding and curing do not lead to any reinforcement of the polymer or to any change in the nature of the bonds involved in film rupture. S. H. Maron, B. Madow, and J. C. Trinastic, all of Case Institute of Technology, Cleveland, O.

Studies on Carbon Black. II.[8] Grignard Analysis. Different types of tightly bound oxygen on carbon black have been distinguished by Grignard analysis. Carbonyl oxygen tends to be from 13 to 30% greater in amount than hydroxyl oxygen for all blacks. About 26% of the total content of tightly bound oxygen is accounted for by Grignard anaylsis. The greater part of the oxygen on the black is thus more or less chemically inert. Comparison of the different types of oxygen liberated on heating to 1000° C. with the types existent on the surface at room temperature show order of magnitude correlation between oxygen liberated as water above 950° and hydroxyl oxygen. There is no correlation among the other types of oxygen. This condition seems to justify the conclusion that the distribution of oxygen (other than hydroxyl) obtained from the analysis at 1000° is defined by the pyrolytic equilibrium established on heating to 950-1000°. It has no relation to the distribution of bonds prevailing naturally upon the black before it is heated. Although the great majority of the oxygen is unreactive toward Grignard, the minor reactive part may well be of importance to the behavior of carbon black in rubber. D. S. Villars, Jersey City Junior College, Jersey City, N. J.

[8] Work done at general laboratories, U. S. Rubber, Passaic, N. J.

A Critical Comparison of a Highly Reinforcing Furnace Black with Easy Processing Channel Black. The efficiency of operation and the high degree of product control inherent in the furnace process for the manufacture of carbon black will result in the gradual obsolescence of the older competitive channel process. It is therefore of great importance that the rubber technologist have a fundamental understanding of the basic structural relation between the types of reinforcing carbon blacks produced by these two different processes. This paper presents data showing these relations between a highly reinforcing furnace black and an easy processing channel black. The processing characteristics and physical properties of rubber stocks obtained using these two types of black in a typical tire tread recipe are also described. A critical comparison of the highly reinforcing furnace black with the channel black is made on the basis of the fundamental structural data and the rubber data obtained.

Basic structural information on the furnace and channel black was obtained from electron microscope studies and consists of particle size and particle size distribution data as well as observations on the tendency of the primary particles to form aggregates. The extent and nature of the carbon surfaces were determined by a number of different techniques, including the Brunaur, Emmett and Teller method of low-temperature nitrogen adsorption; liquid phase adsorption of iodine and diphenyl guanidine; differential heats of adsorption using nitrogen and gaseous hydrocarbons as adsorbates; and determination of the amount and composition of the volatile matter liberated on high temperature heating of the blacks.

Rubber properties of these blacks were studied in natural and synthetic rubber. Laboratory abrasion results and their correlation with actual roadwear performance are emphasized. On the basis of all the available information it is concluded that furnace blacks are not only completely adequate as replacements for channel black in rubber tires, but actually possess many attractive advantages over the channel blacks. C. A. Stokes, Godfrey L. Cabot, Inc., Boston, Mass.

The Vulcanizing Characteristics of Reinforcing Furnace Carbon. The high quality of fine furnace carbons, as already developed for rubber compounding, assures the future of this product, particularly in view of the efficiency of the manufacturing process and the present-day economics of natural gas. A major difference between the compounding behavior of reinforcing furnace carbon and channel black lies in the differing effects on rate of vulcanization. A full appreciation of this difference and the available means of approach toward reconciling these effects is essential to the best practical use of the furnace product.

Data are presented showing chemical evidence, as well as physical test results, to establish the cure behavior of the two types. Reticulate chain structure is discussed in connection with the possible danger of confusing the modulus increase which structure produces with indication of the physical state of cure. The question is brought up as to whether identical state of cure represents the optimum for tread compounds containing both types of carbon, and certain evidence is offered indicating that a somewhat more advanced state of cure can be tolerated with fine furnace carbon.

The fundamental effects of organic accelerators on GR-S and natural rubber treads containing reinforcing furnace carbon are shown. The processing difficulties which follow the use of excessive proportions of accelerator in *Hevea* rubber are considered, and conversely the dangers associated with excessive reduction are brought out.

Suggested means of maintaining safe ratios of accelerator through the use of chemical retardants and retarding softeners are included, and a broad compounding approach based on present-day knowledge is advanced. D. F. Cranor, J. W. Snyder, and A. G. Cobbe, all of Binney & Smith, New York.

Basic Reactions Occurring during Reclaiming. I. The Influence of Temperature, Antioxidant, and Defibring Agents on Natural Rubber. Although the reclaiming of rubber has been an art practiced by industry for many decades, its fundamental processes have hardly changed during that time, and very little basic work in regard to the reactions occurring during the reclaiming process has been done. The present systematic study deals with the effect of the surrounding atmosphere during the reclaiming process as well as the effects of antioxidant, alkali, and metallic chloride defibring agents on the rubber hydrocarbon itself. Data are presented on the acetone and chloroform extracts and the unsaturation of a vulcanized natural rubber compound subjected to reclaiming by the pan process and digester process in the presence of water, alkali, or metallic chloride solutions over a range of up to 16 hours of reclaiming at 194° C.

The practical differences between alkali and metallic chloride reclaims so well known to the reclaimer and rubber compounder find their counterpart in the differences of the respective analytical data obtained from each reclaim. The defibring agents, while fulfilling their purpose, exert a very definite influence on the course of the reclaiming reactions occurring within the rubber hydrocarbon itself. This influence is specific to the nature of the defibring agent. The role of oxygen during the reclaiming process is analyzed and the results are discussed on the basis of hydroperoxidic oxidation reactions. D. S. le Beau, Midwest Rubber Reclaiming Co., East St. Louis, Ill.

A Method for Determination of Surface Area and Particle Size of Latex. I. Application to Type II GR-S Latex with Neutralized Fatty Acid. A method is described for determination of the average surface area and particle diameter of rubber in a latex.

Two techniques have been developed for detection of the surface saturation point.

Both involve the titration of latex with standard soap solution, but in one the saturation point is detected by surface tension measurements, while in the second by electrical conductance. The results obtained by the two methods are concordant, and they permit correction for the amount of unadsorbed soap in a latex.

Using the above method, the surface areas and average particle diameters have been evaluated for three Type II latices with neutralized fatty acid. With two of these latices six different soaps were used, while with the third five soaps. The results show mean deviations ranging from 1.0 to 2.4% in particle diameters of each latex.

A simplified method is described by which approximate but satisfactory results for surface area and particle size can be obtained more quickly than by use of the more elaborate method. S. H. Maron, M. E. Elder, and Irwin N. Ulevitch, all of Case Institute.

A Process for Concentrating Latex. I. Concentration of Type III GR-S Latex by Use of Sodium Chloride. A process for rapid concentration of GR-S latex has been developed which involves gelation of a latex by addition of electrolyte and cooling, and subsequent processing of the mix to yield a fluid and rapidly filterable mass. The filter cake of polymer gel obtained reverts readily on warming to room temperature to stable latices of 60-70% solids contents. When processing is right, the serum removed is free of polymer.

The present paper describes the application of the process to Type III GR-S latex and sodium chloride as the added electrolyte. With this latex and electrolyte, concentrates have been prepared which are exceptionally stable and which at 60% solids show all the characteristics of a good latex. Analysis of the products shows that 7-20% of the soap in the processed latices passes into the serum, as well as 60-80% of the added electrolyte. As a result of the small quantity of residual electrolyte in such concentrates, they exhibit gel points below room temperature. S. H. Maron, C. Moore, J. G. Kingston, I. N. Ulevitch, J. C. Trinastic, and E. H. Borneman, Case Institute.

Cotton *vs.* Rayon Truck Tire Cords

ACCORDING to the National Cotton Council Memphis 1, Tenn., truck tires made with cotton cord gave approximately twice the mileage of tires using rayon cord in recent road tests; one cotton cord tire outlasted three recappings and 100,000 miles of service. Among 12 tires using four different kinds of fabric, of which three were cotton and one rayon standard, average mileages were 46,399, 50,673, and 50,975 miles for the cotton cord tires, and 25,958 miles for the rayon cord tires. All tires tested were made of 70% synthetic and 30% natural rubber and were manufactured under identical conditions in identical molds. The tests conducted were said to be among the few road tests made in which all specifications were the same for all tires except for the fabric. The tests were made on a fleet of gasoline trucks operating in Florida and Georgia under winter and summer conditions. Truck loadings were such as to give an overload of 8.75% for the tires, which were inflated to a pressure of 80 pounds.

A. S. T. M. Committee D-11 Atlantic City Meeting

IN OUR July issue (page 509) a general report on the fiftieth annual meeting of the American Society for Testing Materials, held at Atlantic City, N. J., during the week of June 16 and including abstracts of the papers presented before the symposium on rubber testing, was given. The activities and actions of Committee D-11 on Rubber and Rubber-Like Materials at this meeting could not be prepared in time for our July issue, but are now available in essentially complete form and are recorded herewith.

The meeting of Committee D-11 took place during the afternoon of June 18, with Chairman Simon Collier, Johns-Manville Corp., presiding and assisted by the secretary of the Committee, A. W. Carpenter, B. F. Goodrich Co. This meeting was preceded by meetings of the various subcommittees on June 17 and 18. A total of about 150 members and visitors was in attendance at these meetings.

General Actions

A request from the president and the executive secretary of A. S. T. M. for individual contributions from committee members to help eliminate a deficit of $27,000 in the building fund in connection with the new Society headquarters was considered. A motion was passed that the membership of D-11 be circularized for contributions and L. V. Cooper, Firestone Tire & Rubber Co., was appointed to receive these contributions, assisted by J. F. Anderson, of Goodrich.

New subcommittee appointments: Subcommittee 1 on Hose; A. M. Finley, Goodyear Tire & Rubber Co., has resigned; new chairman not yet appointed. Subcommittee 10 on Physical Testing of Rubber Products: J. L. Bearden, Goodrich, has resigned, and Mr. Cooper was appointed new chairman. Subcommittee 18 on Flexing Tests: Walter Geldard, United States Rubber Co., has resigned, and B. S. Garvey, Jr., Sharples Chemicals, Inc., was made new chairman. Subcommittee 20 on Adhesion Tests: A. H. Flower, Inland Mfg. Division, General Motors Corp., has resigned; new chairman to be appointed.

Dr. Flower, the retiring chairman of Subcommittee 20, was appointed a consulting member of D-11 in appreciation of his years of service. At the suggestion of Mr. Cooper a standing vote of the membership was taken as a further note of this appreciation.

The Federal Specifications Board in April, 1947, recommended that all laboratory testing be carried out in a standard atmosphere of 73° F., ±2° F., and 50% relative humidity, ±2%. D-11 voted to consider and investigate these conditions over a period of two years through its Subcommittee 10.

A request from W. A. Hansley, Sears, Roebuck & Co., for a method of test for determining the coefficient of friction of rubber soles and heels and flooring resulted in the formation of a new subcommittee on this subject; chairman to be appointed at a later date.

It was voted that a committee of D-11 be named to work with the National Bureau of Standards on the matter of providing standard samples of rubber and rubber compounds for use by the members of D-11 and others.

A motion was passed to have the chairman of D-11 appoint a member to serve on a Society committee on appearance specifications.

Committee D-20 on Plastics requested a D-11 representative on its section on flammability. It was voted that Mr. Carpenter, the liaison member on D-20, serve on the flammability section until further representation may be needed.

The formation of a new subcommittee on the subject of the standardization of the testing of rubber thread was approved. Mr. Carpenter stated that at least three companies which are manufacturing rubber thread and one of the largest commercial laboratories working in the field of consumer products all have expressed an interest and have indicated that they think work should be done on standard test methods.

Mr. Carpenter, as secretary of D-11, reported that as a result of a letter ballot conducted in connection with the annual report of D-11 to the Society, 123 votes were cast and all recommendations as well as the report itself were approved.

R. A. Schatzel, Rome Cable Corp., reported that after the remaining untranslated documents and data from the German industry had been gone over at the request of the Department of Commerce, about 10% of this material was selected as worthy of complete translation. When that translation has been made, the material will again be submitted to D-11, and it will then be determined whether the Department of Commerce will make a complete translation available to anyone on request. In the meantime the titles of those subjects indicated as worthy of translation will be incorporated in a report to D-11 with the recommendation that this report be published. The material will be available in the original German in the form of microfilm to anyone who requests it.

Reports of Subcommittees

SUBCOMMITTEE 4 ON PROTECTION OF PERSONS FROM ELECTRIC SHOCK. Gordon Thompson, Electric Testing Laboratories, Inc., chairman, reported that this subcommittee was still in the process of organization and that except for some data on the effect of exposure of rubber goods of this sort to ozone, no results were available. Chairman Collier of D-11 pointed out that this subcommittee is being organized as part of D-11 and that it will also act as a sectional committee of the American Standards Association.

SUBCOMMITTEE 5 ON INSULATED WIRE AND CABLE. Chairman Schatzel reported that some federal specifications submitted for review by the Federal Specifications Board will be returned with comments.

A request of the Navy Department for consideration of 35° C. as a standard condition for testing will be answered by reference to the action taken previously on the FSB recommendation.

Method D 734-43T, Specification for Insulated Wire and Cable: Polyvinyl Insulating Compound, was recommended to continue as a tentative. D 752-46T, Specification for GR-M Polychloroprene Sheath Compound for Electrical Insulated Cords and Cables, is to be advanced to the position of a regular standard. D 812-44T, Specification for GR-S Synthetic Rubber Sheath Compound for Electrical Insulated Cords and Cables Where Extreme Abrasion Resistance Is Not Required, is to be abandoned.

Subcommittee 5 discussed the question of developing standards for thermoplastic

insulating appliance wire and for rubber insulating appliance wire.

The specifications for thermoplastic jackets were again reviewed and again referred back to the section for further comment and work with respect to including recommendations for sheet thickness.

Editorial changes in D 469-46, Specification for Insulated Wire and Cable: Heat-Resisting Rubber Compound; D-27-46T, Specification for Insulated Wire and Cable: Class AO, 30% *Hevea* Rubber Compound; and D 734-43T, as suggested by the section on this matter, were referred back to the section for further review to determine the adequacy of the proposed revisions.

SUBCOMMITTEE 6 ON PACKING. F. C. Thorn, Garlock Packing Co., chairman, first reported the formation of a new section under R. T. Halstead, Johns-Manville, to standardize the procedure for determining the tendency of compressed asbestos gaskets to corrode adjacent metal surfaces. Since the test methods for packings are now fairly well standardized, an attempt will be made to write material specifications for compressed asbestos sheet and rubber sheet packings, in the case of the former, however, waiting until the publication of the gasket specification of Technical Committee A. In the case of rubber sheet packings, the industry will be approached to see if there is any consensus of opinion on acceptable grades of rubber sheet packings for general water, air, and low-pressure steam service. These new specifications are to be written so as to tie in, if possible, with D 735-46T, Specification for Rubber and Synthetic Rubber Compounds for Automotive and Aeronautical Applications.

SUBCOMMITTEE 11 ON THE CHEMICAL ANALYSIS OF RUBBER PRODUCTS. Mr. Collier, chairman, reported that comments on the revision of Federal Specification ZZ-R-601 are to be given to T. A. Werkenthin, Navy Department, Bureau of Ships. A revision of ZZ-R-601 and A. S. T. M. D 297-43T is contemplated.

The section on the analysis of sulfur in rubber products plans a program and expects to use the questionnaire method to find out what changes are considered desirable in present procedure.

A new section on the analysis of reclaimed rubber has been formed and will review methods for the determination of cellulose and carbon black reclaimed rubber.

The section on the analysis of carbon black in rubber products will continue work on new and old methods in the hope of making further improvements.

The section on the analysis of synthetic rubbers will continue work on the problem of the analysis of GR-S-natural rubber mixtures.

The Bureau of Ships will submit for consideration by the subcommittee a method for the determination of plasticizers in rubber in contact with gasoline.

SUBCOMMITTEE 14 ON ABRASION TESTS FOR RUBBER PRODUCTS. R. H. Taylor, National Bureau of Standards, chairman, reported further discussion on the work of T. R. Griffith, National Research Council, Canada, which shows that much better correlation of laboratory and service abrasion tests is obtained if the laboratory samples are extracted with alcohol-tolvene azetrope before testing. Mr. Taylor also reported on the results of some of the discussion of Subcommittee 24 on Coated Fabrics which has been investigating abrasion tests for these materials. Subcommittee 24 has agreed to discontinue the use of the Taber abrader for the present and has recommended that all Wyzenbeek abraders be returned to the manufacturer for reconditioning.

The section on tear testing submitted a report of the reproducibility of the various methods of test and was given the further task of incorporating its recommendations into a revision of D 624-44, Method of Test for Tear Resistance of Vulcanized Rubber.

SUBCOMMITTEE 15 ON LIFE TESTS FOR RUBBER PRODUCTS. H. E. Outcault, St. Joseph Lead Co., chairman, reported that G. C. Maassen, R. T. Vanderbilt Co., has been appointed vice chairman of this subcommittee.

The British Commonwealth Scientific office, United Kingdom Scientific Mission, Washington, D. C., has advised the subcommittee of facilities being prepared in West Africa for the aging of rubber products.

The section on methods of aging of vinyl chloride compounds reported continuing delay because of the shortage of plasticizers, but was urged to get some preliminary testing work started.

The section investigating air oven aging tests is about to start a repeat test with eight laboratories cooperating with a procedure expected to eliminate much of the variability in results which developed in the first series of tests recently completed.

The section on the study of GR-S aging data reported no progress. Mr. Werkenthin resigned the chairmanship of this section, and R. D. Stiehler, National Bureau of Standards, was appointed the new chairman. An attempt will be made to obtain data from the larger rubber companies and consumers and from information that has already been published in the literature.

The section on miscellaneous properties of rubber and rubber-like materials reported the need of basic research on the causes of aging. It was approved to request D-11 to sponsor research work on the absorption of oxygen, effect of decomposition by sunlight, etc.

The section on the effect of ozone aging and its relation to sunlight aging is being organized with J. C. Dudley, Chrysler Corp., replacing W. J. Simpson, and J. B. Littman and L. E. Cheyney being added to this section.

A study of the water jacketed air oven for aging rubber products was assigned to the section on air oven aging.

It was agreed to continue as tentative standards D 749-43T, Method of Calibrating a Light Source Used for Accelerating the Deterioration of Rubber, and D 750-43T, Method of Test for Resistance to Accelerated Light Aging of Rubber Compounds, because of the lack of experience in their use.

SUBCOMMITTEE 17, TESTS ON HARDNESS, SET AND CREEP. Chairman Cooper recommended that D 531-41, Method of Test for Indentation of Rubber by Means of the Pusey & Jones Plastometer, be tentatively modified by insertion of the following paragraph:

"When testing soft stocks which would give a reading of 200 or over when using 1/8" ball point, the ball point be changed to a 1/4" point and that the reading be taken at 15 seconds ± one second. When reporting such hardness determinations it will be necessary to include with the figure the statement as to how the data was obtained."

A German modification of the Shore durometer was exhibited, and its advantages of ease of calibration, ruggedness, and quality were explained.

The tentative revision of D 395-46T, Methods of Test for Compression Set of Vulcanized Rubber, calling for a maximum of four plies in the plied up compression set sample was objected to by several members, and the original section was reconstituted under A. E. Juve, Goodrich, to study further the effect of plying up samples to the extent of at least seven plies.

The section on creep presented a progress report. Mr. Thorn stated that data to date indicate the possibility of studying relaxation without encountering too much difficulty. Creep under compression may be more difficult as some stocks have a tendency to adhere to the contact platens even when lubricated and therefore show low creep figures.

SUBCOMMITTEE 19, TESTS FOR PROPERTIES OF RUBBER AND RUBBER-LIKE MATERIALS in Liquids. R. M. Howlett, Standard Oil Development Co., chairman, reported that minor changes in the specifications for Reference Fuels No. 1 and No. 2 are being investigated. The Army-Navy aviation gasoline specification no longer permits the use of the inhibiter required in D 471-46T. Three different inhibiters are being tested, and if the results are satisfactory, a change of inhibiter will be proposed, together with a clarification of the method of running the distillation on diisobutylene.

SUBCOMMITTEE 21, TESTS OF LIQUID RUBBER PRODUCTS. J. F. Anderson, Goodrich, chairman, reported that changes in D 816-46T, Methods of Testing Rubber Adhesives, as suggested by the North American Aviation Co., Inc., in June, 1946, would be deferred until more evidence of the overall practicability of the changes was obtained.

Data accumulated from a series of tests for the viscosity of rubber cements using the Ford cup viscosimeter have shown the inadvisability of adding this instrument as an alternate means of testing viscosity in D 553-42, Methods of Test for Viscosity and Total Solids Content of Rubber Cements.

A series of tests using D 816-46T indicate the need of still further work to prove (a) the full adaptability of the methods and (b) that results can be correlated sufficiently to draw up specification limits.

A special section under J. F. Manning was appointed to formulate a reclaim base cement and a rubber base cement to be used in the same series of tests mentioned above.

Work on a stability test for latices under J. J. Allen, Firestone, is expected to provide a method of test within the next six months.

SUBCOMMITTEE 22, CELLULAR RUBBERS. H. G. Bimmerman, E. I. du Pont de Nemours & Co., Inc., chairman, reported that this subcommittee met in Akron, O., in April, 1947, to discuss compression-deflection test machines and that a section had been appointed to work on a machine for testing finished products. Mr. Bimmerman was invited to attend a meeting of the RMA specification committee for foamed rubber. RMA is considering changes in its buyer's specifications and would like to see A. S. T. M. and RMA in agreement on tests and specifications. There is an indicated desire for separate specifications for foamed and chemically blown sponge rub-

ber. The subcommittee will study these requests.

SUBCOMMITTEE 23, HARD RUBBER. H. J. Flikkie, Goodrich, chairman, reported that the following changes in D 530-44T, Methods of Testing Hard Rubber Products, are recommended to D-11 for action by letter ballot: (1) In the first sentence of paragraph 9b, change the word "scratched" to "marked." (2) In section 30 on Procedure, change the first sentence to read, "The test specimen shall be placed on the anvil of the machine without previous heating and the thickness read from the dial gage immediately after applying the load of 1000 pounds." (3) In section 35, change the second sentence to read, "The test specimen shall be placed on the forge and a load of 5½ pounds applied."

SUBCOMMITTEE 24, TESTS FOR COATED FABRICS, S. H. Tinsley, Vanderbilt, chairman, reported that the section on abrasion tests under W. N. Keen had submitted a progress report and outlined future work required. In the course of an open discussion of the merits of various abrasion machines for this type of work, A. F. Schildhauer, of du Pont, demonstrated a machine made by the American Sheeting Co. Further tests with various machines will be conducted.

The section on adhesion tests under E. B. Roberts, Hood Rubber Co. Division of The B. F. Goodrich Co., reported that development of adhesion tests for thin coatings was to receive the most attention since the present tentative standards seem adequate for ordinary rubber coated fabrics.

The section on scrub and flex tests under Mr. Schildhauer presented a report giving the results of a series of tests, and it was decided to continue work on these subjects and develop specifications for the proper type machine and procedure for evaluating end point.

SUBCOMMITTEE 25, LOW TEMPERATURE TESTS FOR RUBBER AND RUBBER-LIKE MATERIALS. R. S. Havenhill, St. Joseph Lead, chairman, reported that a low temperature test using the Yerzley oscillograph had been developed and approved. An addition will be made to this method to cover the use of a built-in cold box and the use of packaged air. Arrangements have been also made for a cooperative test program to be conducted on 13 compounds by several laboratories.

It was recommended that D 832-46T, Recommended Practice for Conditioning of Rubber and Plastics Materials for Low Temperature Testing, be continued as tentative without revision. Work is being started on a compression set test.

Mr. Carpenter suggested that the subcommittee should investigate the Gehman torsional stiffness test apparatus since this small apparatus lends itself readily to making a large number of tests.

SUBCOMMITTEE 26, PLASTICITY TESTS. V. L. Smithers, V. L. Smithers Laboratories, chairman, reported that two proposed methods of tests, one for "Plasticity and Recovery of Rubber-Like Materials by the Parallel Plate Plastometer" and the other for "Viscosity of Rubber-Like Materials by the Shearing Disk Viscometer," were discussed, and several slight changes recommended.

In addition the subcommittee will be circularized in an effort to establish a definite time and temperature for the parallel plate test, a new section will be formed to study cure characteristics, and another section will be formed to study present methods of determining "nerve" in rubber.

SUBCOMMITTEE 27, TESTS FOR RESILIENCE. E. G. Kimmich, Goodyear Tire & Rubber Co., chairman, reported that it recommended to D-11 for adoption as a tentative standard a method of measuring resilience and related properties in compression and shear using the Yerzley oscillograph.

An extensive report on a review of the literature on resilience was received with appreciation from L. R. Sperberg, Phillips Petroleum Co.

Progress was reported on the interlaboratory tests on resilience being carried on with Subcommittee 25 and Section 1 of Technical Committee A.

TECHNICAL COMMITTEE A ON RUBBER PRODUCTS. J. L. McCloud, Ford Motor Co., chairman, made the following report of the activities of the various sections.

Section 1 has done a large amount of work on the testing and formulation of vibration dampeners, and this work is still in progress.

Section 2 on bumpers has about completed its testing and is ready to write test specifications.

Section 3 has revised and added to the coolant hose specifications, and all changes have been accepted. Brake hose requirements have been revised, but are not yet accepted. Specifications for unreinforced windshield wiper hose and heater hose are being written.

Section 4 has revised the compound tables and development of tests for these compounds. A specification for testing the staining of painted or lacquered surfaces by rubber has been proposed. A product specification for floor mats is being written. A method for testing the resistivity of conductive rubber is about completed.

Section 5 on fan belts has made definite progress in standardizing fan belts and the methods of testing them.

Section 10 on gaskets reports that specifications are completed and ready for approval.

Section 11 on oil seals has been reactivated.

Technical Committee A recommended revisions in D 571-44T, Methods of Testing Automotive Hydraulic Brake Hose, consisting of the addition of a test with a salt spray to determine its effect on metal parts and changing the requirement as to the length of the specimen used in the whip test.

New Plasticizers

THE development of two new plasticizers, Monoplex 11 and Monoplex 16, was recently announced by the Resinous Products & Chemical Co., Washington Square, Philadelphia 5, Pa. Monoplex 11 the dialkyl ester of a synthetic long-chain dibasic acid, shows outstanding plasticizing efficiency in polyvinyl chloride stocks, with good low temperature and ultra-violet resistance properties at much lower volatility than is usually found combined with such excellent solvating action. Stocks plasticized with Monoplex 11 have excellent hand and drape, it is also claimed. The plasticizer is particularly suitable for high pigment loadings where the retention of flexibility and abrasion resistance are important qualities.

Monoplex 16, a high molecular weight nitrile plasticizer, gives polyvinyl chloride stocks of superior heat and ultra-violet stability, outstanding permanence, good low-temperature flexibility, and extremely low water sensitivity. An outstanding feature of Monoplex 16 is the smoothness which it imparts to milled stocks. The relation of temperature to solvating action of this plasticizer is well suited for dispersion compounding.

Both Monoplex 11 and 16 are compatible with such elastomers as neoprene, nitrile rubbers, and polyvinyl butyral, and in film formers such as cellulose acetate butyrate. Suggested uses include the application of these plasticizers in free film for rainwear, shower curtains, upholstery, and luggage, and for coated fabrics.

Bond-It Adhesive

BOND-IT a thermosetting elastic cement, is being offered for bonding all types of natural and synthetic rubbers to rayon, nylon, or cotton fabrics, yarns, cords, fibers, etc. The synthetic rubbers to which excellent adhesion can be obtained, according to the manufacturer, include GR-S, neoprene, and nitrile types. The cement, it is claimed, gives cured films that are waterproof, have excellent resistance to natural, oxygen bomb, and oven aging, are not appreciably affected by exposure to lubricating oil at normal temperatures, and resist exposure to temperatures as high as 300° F. Bond-It, moreover, has no harmful effects on rayon, nylon, or cotton either initially or after natural or accelerated aging.

The cement is supplied in a consistency suitable for most applications. Further thinning can be done with Bond-It Thinner or, to a limited extent, with toluol. The cement can also be furnished in dough form for spreading or knife-coating. Bond-It can be applied by any of the conventional methods, such as brushing, dipping, spreading, etc. The coated or impregnated material should be dried until free from all solvent, then either used immediately or stored at normal temperatures until required. Any of the usual means, such as calendering, extruding, spreading, cementing, etc., can be used to attach the rubber to the textile after coating with Bond-It. The cure of the composite article will depend on its thickness, but a minimum cure of 20 minutes at 300° F. is necessary to give the cement its maximum adhesion. Considerable overcure can be tolerated without adversely affecting the bond, the manufacturer also claims.

R. I. Club Golf Tournament

THE annual golf tournament and outing of the Rhode Island Rubber Club was held at the Pawtucket Golf Club on June 19. A heavy shower at tee-off time dampened the start of the tournament, but after a short delay some 40 golfers were on the course. The kicker's handicap was won by H. W. Kugler; while the low gross prize went to William Maguire, who carded 75. The prize for second low gross was won by William Newman for his score of 77.

Following the tournament, a dinner was held attended by 115 members and guests, the largest assemblage in the Club's history. Everyone attending received a prize, made available through the courtesy of some 46 rubber and supplier companies.

Additional Experimental GR-S and GR-S Latices

ADDITIONS to the list of experimental GR-S dry polymers and GR-S latices available for distribution to rubber goods manufacturers, together with certain reauthorizations of previously listed polymers, from the Office of Rubber Reserve, RFC, under the conditions outlined in our November, 1945, issue, page 237, have been received and are listed in the table below.

Normally, experimental polymers are produced only at the request of the consumers, with 20 bales of the original run being set aside for distribution to other interested companies for their evaluation. Such rubber is available in quantities of one bale to two bales upon request to the ORR Sales Division within six months after the experimental polymer was produced. Subsequent production runs are made if sufficient requests are received to warrant it.

X-Number	Manufacturing Plant	Date of Authorization	Polymer Description	Special Characteristics
X-395-GR-S Latex	U. S. Rubber, Naugatuck	6/10/47	Same as Type IV GR-S Latex except free styrene (volatile unsaturates) is specified at 0.05% maximum.	For latex uses where a minimum odor is important.
X-396-GR-S	U. S. Rubber, Institute	6/20/47	GR-S-10 except that it is stabilized with 1.5 parts UBUB. Mooney viscosity is 50 to 58.	A non-staining and non-discoloring type GR-S-10 which is expected to show the improved physical properties, particularly in mineral pigment compounds, which other rosin-type polymers exhibit.
X-397-GR-S	Firestone, Lake Charles	6/21/47	GR-S-AC except for a non-staining-type short-stopper and stabilization with 1.5 parts BC.	Non-staining and non-discoloring-type alum GR-S. Alum rubbers normally exhibit low water absorption properties. Antioxidant BC is newly developed stabilizer.

Detroit Group Outing

THE Detroit Rubber & Plastics Group, Inc., held its summer outing on June 27 at the Forest Lake Country Club, Pontiac, Mich. Approximately 160 members and guests attended the dinner, and nearly 100 players participated in the golf Tournament. The outing, the first held since the start of the war, was generally termed the most satisfactory to date. Arrangements were made by Tom Halloran and George Horsfull, assisted by J. P. Wilson, Wm. Davies, and Edward Kvet, secretary-treasurer of the group. Harry E. Outcault, vice chaiman of the A.C.S. Division of Rubber Chemistry, attended and spoke briefly on his work as liaison officer between the Division and its sponsored rubber groups

Door prizes were awarded to R. C. Lilly, of General Motors Research, Stan Baxter, of Allen Industries, S. Linder, of Minnesota Mining & Mfg. Co., Edward Hindle, of United States Rubber Co., P. H. Smith, Firestone Tire & Rubber Co; and V. Root, Johnson Rubber Co. In the golf tournament, first prize for low score went to R. Hannon, of Minnesota Mining; while Al Korejwa, of Wyandotte Chemicals, made high score. Prize winners in the kicker's handicap, selected by lot from a group of 25 contestants, were A. Schosberger, of Kaiser-Frazer; P. Stout, Oakland Machine Co.; J. Swint and P. H. Smith, both of Firestone; and F. L. Kilbourne, of Xylos Rubber Co.

Discontinue Authorizations for GR-S Latex Drum Purchases

EFFECTIVE July 1, 1947, the issuance of Office of Rubber Reserve purchase authorizations covering purchases of drummed GR-S latex from distributers of GR-S latex was discontinued. Purchases of GR-S latex in drum lots are now made directly from the supplier without prior authorization from ORR. Purchasers of GR-S latex in tank-car lots should continue to send their purchase requests to the Sales Division, Office of Rubber Reserve, in accordance with established procedure.

Boston Group Outing

THE Boston Rubber Group held its eleventh annual outing on June 27 at the Woodland Golf Club, Newton, Mass. An attendance of 430 members and guests, the largest in the Group's history, participated in the afternoon sports program and partook of an excellent lobster dinner in the evening. Arrangements for the outing were made by Owen J. Brown, Jr., of Godfrey L. Cabot, Inc., assisted by Harry W. Sutton, of Boston Woven Hose & Rubber Co., and Harry Atwater.

In addition to door prizes, awards were distributed to sports contest winners. In the golf tournament, low net went to J. Upham, of Hercules Powder Co., while J. Bernard took low gross. The kicker's handicap was won by W. B. Richardson, of American Mineral Spirits Co., and the prize for the nearest pin went to J. C. McKay, of Phillips Petroleum Co. Longest drive was made by J. N. Manning, of Angier Products Co.; most 4's was won by W. A. Maguire, of United Carbon Co.; and the prize for most 7's went to F. D. Bean, of Hood Rubber Co.

In the tennis tournament, prizes went to John Ball, of Midwest Rubber Reclaiming Co., and William Walker, of Hood Rubber Co., A. E. Baker and C. E. Wilson, of Sun Oil Co., were victorious in the horseshoe pitching contest; while Willard B. DeWolf, of Bunatak, Chemical Co., won the darts contest. In softball, the Avon Sole Wildcats lost to Ashley's Bearcats.

Hercules Reduces Resin Prices

SWEEPING reductions, ranging from 10 to 25%, in the prices of major-volume synthetic resins for the paint, varnish, lacquer, adhesives, and printing ink industries were announced on July 25 by Hercules Powder Co., Wilmington, Del. Indicative of the extent of the reductions is the new price of 16¢ a pound for Pentalyn A resin, a 16% drop. Under the new schedule Hercolyn, widely used as a replacement for castor oil in protective coatings and adhesives, is at a new low price of 15½¢ a pound. This is claimed to mark the first time that a standardized pentaerythritol ester, Pentalyn A, has sold for the same price as ordinary ester gum. The Pentalyn resins are used extensively in varnishes, adhesives, and printing inks.

The new schedules effect the following price reductions from the January peak reached by the four major groups of Hercules synthetic resins: Cellolyn resins for lacquer, 14 to 16%; Lewisol resins for lacquers, 23%; Staybelite esters for the

(*Continued on page 680*)

Among Those Enjoying the Detroit Group Outing were (Left to Right): T. Halloran (Outing Chairman), Chemical Products Co.; G. Horstul, American Cyanamid Co.; D. R. Seaman, Jr., Seaman Products; Harry Outcault, St. Joseph Lead Co.; M. R. Matteson; E. Zielinski, S. M. Cadwell, and P. J. McGovern, all of United States Rubber Co.; R. L. Heydorn, F. Stout, and G. G. Hunter, all of Baldwin Rubber Co.; H. Denman, Detroit Gasket & Mfg. Co.; and W. Davies, Kaiser-Frazer Corp.

Plastics Technology

The Decorating of Vinyl Films

A. B. Sherry[1]

ONE of the many materials perfected during the war for military uses, which has enjoyed widespread use in post-war living, is unsupported vinyl film. The film, made from polyvinyl chloride or polyvinyl cloride-acetate, was known and made before the war, but high cost and poor physical qualities limited its use. During the war, shortages of rubber and other flexible materials with necessary characteristics stimulated the development of stabilizers and plasticizers which permitted may uses of this flexible, cloth-like material.

As the war ended, the great shortage of cloth fabrics created a demand for something to take their place for civilian use. Since vinyl resins, restricted to essential wartime uses up to that time, were released in sizable quantities for civilian use at the war's end, they were immediately made available to fill this great demand.

Millions of yards of unsupported flexible film were rolled off calenders and cast from solutions and dispersions by rubber companies and companies of the flexible coated industry. This film, mostly clear and uncolored, became the "gray goods" of the film industry. The demand, of course, called for decorative materials, so it was the converter's responsibility to make these films as attractive as possible. The most effective and most practical way of decorating is, as it is in the textile industry, by printing.

Printing on vinyl film is accomplished by use of three different methods, which are as follows:

1. Machine printing directly on the film.
2. Machine printing on paper and transferring to the film.
3. Hand printing on the film by the silk screen method.

Printing Directly on Film

The first method is accomplished by the use of a rotogravure printing machine, or a textile printing machine with very shallow etched cylinders, and is the most important and largest volume process. In this method inks are made with fast drying solvents, a resin base which is similar to that in the film, and pigments and plasticizers.

The rotogravure machine consists of a revolving cylinder called the printing roller which has the required design engraved or etched into the surface, and another roller usually made of rubber, called the impression roller. The printing roller rotates at a given speed partially submerged in a fountain of ink. An oscillating doctor blade wipes all ink except that contained in the engraving. The surface to be printed, or web, is passed between the printing roller and the impression roller which exerts sufficient pressure on this web to enable it to pick all of the remaining ink from the engraving.

The printed web is conducted through a heated chamber where the solvent is removed, and the web is either rolled up ready for fabrication or passed through another set of rollers which deposit another color and design on the surface. As many as four colors can be printed on this type of machine in fairly rapid succession. The speeds vary from 40 to 120 feet a minute.

The flexibility and elasticity of the vinyl material makes for considerable difficulty in obtaining good register in this process of printing directly on the film. Therefore most of the successful multicolor work up to the present has been done with designs not requiring precise register. Methods for obtaining perfect register are being developed which will lead ultimately to process printing directly on the film.

Since the film is sensitive to heat, drying temperatures should not exceed 200° F. unless the web is supported during its exposure to these temperatures.

The textile printing machine consists of a large rotating drum with a series of engraved rollers arranged around its circumference. Each roller has its own doctor blade which, when placed tightly against the roller, forms a trough into which ink of the desired color is placed. The web to be printed is led around the large cylinder between the cylinder surface and the printing rollers and is usually reinforced by a blanket of fabric on the reverse side. The rollers are adjusted to proper pressure for printing, and as the web passes through, the ink is picked from the engravings as described above. It is necessary to have as many rollers as there are colors to be printed. The number is sometimes as high as ten.

Transfer Printing

The second method employs a rotogravure machine printing on paper with a coated surface so that the ink is prevented from bonding tightly. The vinyl film is cast over this print in the form of dispersion or solution, is fused or dried, and then stripped off, taking the ink with it. In this method it is necessary to print in a reverse or, that is, use a mirror image of the desired result.

The printing procedure for this method is exactly the same as just described for method one except that with transfer printing higher temperatures and speeds can be used with less trouble. It is also possible to get perfect register in this process since the web originally printed is made from paper.

Hand Printing

The third method is carried out by leaving openings of the design required on the surface of a tightly drawn fine mesh silk screen. The remainder of the screen is masked off, using special preparations not soluble or reactive with the ingredients in the ink. The film to be printed is secured to a flat surface; the screen is placed on the film, a rubber blade called a squeegee is drawn across the design forcing the ink through the openings. Multicolor is accomplished by using several screens, each containing a part of the design adjusted in such a way that when each successive screen is placed on the film in the same spot, an additional part of the pattern is laid down in a different color. Sometimes as many as 15 or 20 screens are used in one design. Drying of each ink application is absolutely necessary before a new screen can be laid down.

Special Ink Requirements

The ink used in the silk screen process is the same type as that used in the other printing processes except that its drying has been slowed up considerably.

The inks which in many cases are used to decorate vinyl film for window draperies and shower curtains are given rigid weathering, abrasion, blocking, crocking, and fastness tests before being recommended for this use.

Colors are chosen, and formulations balanced in such a way that the inks, which become part of the film, are as durable as the film itself.

Since the film is virtually impervious, and drying by absorption or oxidation is impossible and impractical, the inks must necessarily be of the lacquer type containing volatile solvents. It is, therefore, impractical to consider the use of printing machines containing multiple transfer and distribution rolls.

[1] Stanley Chemical Co., East Berlin, Conn.

Predict Further Growth of Plastics Industry

THE United States plastics industry will continue its phenomenal growth for at least another five years, according to N. N. T. Samaras, director of research of Monsanto Chemical Co.'s plastics division, Springfield, Mass., who spoke before the Eleventh International Congress of Pure and Applied Chemistry, meeting in London, England, on July 22. This growth would be aided by technological developments and abetted by a youthful aggressiveness and versatility that cannot be denied, Dr. Samaras said.

At least 50 million dollars have been spent in the United States on synthetic resin research since 1939, and the number of technically trained specialists in this field has probably trebled during the past eight years. Dr. Samaras stated that this research emphasis will have a continuing effect on the industry whose future growth is based on development of blends of plastics, mechanical alteration of existing materials, innovations in mass production techniques, greater supplies of basic raw materials, and pioneering of plastics research in the field of carbon, silicon, sulfur, phosphorus, and nitrogen types.

In tracing the growth of the industry, Dr. Samaras gave due credit to the development of fabrication machinery and use of continuous processes, together with work on new materials. A study of the industry shows that molding and casting together constitute less than 30% of the total plastics materials output, and this tendency of plastics to find increasing applications in new fields augurs well for the future of the industry. Indicative of faith in the plastics industry's future are the plans of United States plastics producers to spend an estimated 150 million dollars for expansion of production facilities in the 1946-1947 period.

The Injection Molding of Large Parts[1]

E. F. Bachner, Jr.[2]

THE injection molding of plastics parts is not just a simple operation, but one that must be properly engineered from the design stage until the parts are delivered to the customer. This point is especially true in the injection molding of large parts as the total investment of the customer is usually much greater. Therefore I think it would be well to review the general situation and discuss the various problems involved.

The demand for large injection molded parts has increased considerably during the past year. High-speed production methods have extended the usefulness of molded plastics into many new product applications. Manufacturers have become acquainted with the vast possibilities of thermoplastic materials and wish to take advantage of their inherent physical properties. Clear and colored, transparent, translucent, and opaque, or any combination of these are available, thus giving us an unlimited variety. Since the color is inherent in the materal, all spraying and finishing problems are eliminated.

Large thermoplastic parts usually are appreciably lighter than similar parts in other materials. In general, they are lower in specific gravity and because of their tougher nature can be molded in much thinner sections. Parts can also be produced with intricate designs which are faithfully reproduced in this type of molding.

Design Requirements

What are the design requirements for large injection molded parts? Briefly, they should be designed so as to facilitate the flow of the material and allow the mold to fill evenly. We must try not to separate or break up the flow of the material as this practice may cause weld lines or trapped air in the part.

Heavy sections should be avoided where possible as these tend to cause sink marks and slow up the molding cycle. Care must be exercised to eliminate any undercuts in the molding of polystyrene material where generous draft should be provided to facilitate ejection of the part. Some of the softer non-rigid materials can be molded with undercuts which have been designed into the part where this practice has been found to be desirable.

Usually all large molded parts show flow marks or blemishes of some type; therefore parts should be designed so that all flat surfaces are slightly convex or decorated with some type of design to improve the appearance of the molded piece. Good design can reduce objectionable effects from molding and also reduce the tendency toward warpage.

Production Requirements

There are also many production differences in the molding of large injection molded parts. It is well for both molders and designers to review just how these come about.

First of all, since we are using a larger volume of material, it is also true that the material must flow a greater distance before cooling. Therefore in order to mold large parts economically it is necessary to heat the material to as high a degree as possible in the cylinder and then inject the material into the mold at the proper speed. Actual test runs will indicate the maximum cylinder temperature that can be used on a given material. The usual method is to run the material until it starts to burn or discolor slightly and then back off the temperature approximately 10° F. Because of the distance the material must flow, it is necessary to run a warm mold. This die temperature will run anywhere between 95 and 180° F., depending on the design of the part. It is necessary to have some type of circulating system in order to hold a uniform temperature in the mold. In molding large parts the mold temperature is also governed by the wall sections and by ribs and bosses which may require a slower and more uniform cooling to eliminate the sink marks, caused by too fast a cooling of the part.

When the ultimate mold temperature has been determined, the part can then be removed from the die as soon as it is possible to do so without distorting the part. Since the part will still be semi-rigid in that it has not fully hardened, it may be necessary to use cooling fixtures or jigs. These fixtures are also necessary where the cooling must be controlled to hold dimensions. At this point one might be led to believe that the limiting factor in the molding cycle would be determined largely by the rate at which the part could be molded and cooled. Such is not the case. On parts that have been properly designed so as to provide easy flow and fast cooling, we have found that the present machines available cannot heat up the material fast enough.

This point is especially true of polystyrene which has a thermal conductivity less than half that of cellulose acetate. Many of the molders who use this material to any great extent are, therefore, engineering new cylinders of larger heating capacity.

Another method for speeding up production is to preheat the material before it is placed in the hopper. This preheating can be done in an electric oven or by the use of infra-red bulbs. Another promising preheater is the Leiske heater, made by the Leiske Machine Co. of Milwaukee, Wis., which is mounted directly on the machines over the cylinder.

Applications

There has been a great deal of interest recently in thermoplastic radio cabinets. Most plastic cabinets in the past have been produced in thermosetting materials, but present shortages of these materials has led manufacturers to investigate the thermoplastics field. Both ethyl cellulose for its toughness and dimensional stability at low and high temperatures, and polystyrene for its attractive appearance, comparatively low price, and dimensional stability are being considered for radio cabinets.

Other applications for large injection molded parts are found in the electric refrigeration field. Here freezer chest doors drawer pulls, and breaker strips have been molded.

We also have molded the Griffith condiment rack, which adds sales appeal to the customer's product and helps sell a complete set of spices instead of the individual jars.

There has also been a large demand in nursery applications for such things as training seats, dishes, cups, and toys. Applications are also being developed in many new fields which heretofore had seldom been considered.

The cost of thermoplastic materials is somewhat higher; however, a greater number of parts is produced from each cavity on an injection mold than from a similar compression mold. This advantage, together with the variety of colors and thinner wall sections used, makes large thermoplastic parts competitive and desirable.

[1] Presented before Society of Plastics Industry, annual convention, Chicago, Ill., May 9, 1947.
[2] Chicago Molded Products Corp., Chicago, Ill.

Pyroxylin-Coated Fabrics and Paper

THE following are the figures for pyroxylin-coated fabrics and paper for the first quarter of 1947, as reported by the Bureau of the Census, United States Department of Commerce. The statistics are based on reports from 27 companies and represent the operations of processors who coat or impregnate fabrics or paper with soluble cotton or pyroxylin preparations, either separately or in combination with other materials. "Light" cotton fabrics include sheetings and print cloths; "heavy" cotton fabrics include drills, ducks, sateens, broken twills, and moleskins. All figures are given in linear yards, except for pyroxylin spread and monthly capacity, given in pounds.

	January	February	March
Total (except non-fabric materials):[1]			
Shipments	9,423,230	8,386,286	7,896,769
Unfilled orders[2]	12,530,561	12,152,222	11,457,795
Light cotton fabrics:			
Shipments	5,047,462	4,531,538	4,151,454
Unfilled orders[2]	6,143,881	6,142,361	6,126,255
Heavy cotton fabrics:			
Shipments	2,469,100	2,367,129	2,483,250
Unfilled orders[2]	4,821,057	4,532,868	4,280,514
Custom coating:[3]			
Shipments	1,906,668	1,487,619	1,262,065
Unfilled orders[2]	1,565,623	1,476,993	1,051,026
Non-fabric Materials:			
Shipments	383,535	253,454	245,379
Unfilled orders[2]	490,194	447,731	333,026
Pyroxylin actually spread, lbs.	7,754,273	7,201,280	6,533,941
Monthly capacity,[4] lbs.	16,722,847	16,722,847	16,722,847

[1] Data include an undetermined quantity of custom coating of non-fabric materials.
[2] Orders on hand at the close of the month, exclusive of contracts, with shipping dates unspecified.
[3] Data for fabrics other than cotton are included with custom coating to avoid disclosing data for individual establishments.
[4] Based on all machines suitable for pyroxylin coating, assuming 600 working hours per month of entire production on 53"-1.32 sateen coated to a finished weight of 17.5 oz linear yd., assuming 40% solids.

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OTS Bibliography Reports on Rubber Products—VII

THE abstracts printed below are taken from the Department of Commerce's weekly publication, "Bibliography of Scientific and Industrial Reports." Copies of the complete reports, either on microfilm or as photostats, as indicated, may be obtained from the Office of the Publication Board, United States Department of Commerce, Washington 25, D. C.

Reports of Visits to Synthetic Rubber Plants in Germany, May 3 and 4, 1945. Sidney D. Kirkpatrick. (Supreme Hdq., A.E.F. Production Control Agency. G-4 Division, Serial 6). PB 8276. 1945. 3 pages. Photostat $1; microfilm 50¢. The I. G. Farbenindustrie Works at Leverkusen has a new building well equipped with excellent testing equipment and also contains a pilot-plant for making tires of Buna rubber. Dr. Baumann, at the I. G. plant at Huls, reported that they had made considerable progress with an electric arc process for producing carbon black as a by-product in the manufacture of acetylene from natural gas. The Degussa lamp black plant of Carl Hisgen, A.G., at Worms-Rhein, produces *flammenruss* principally for inks, paints, and varnishes, but some has been used by German tire manufacturers as an extender when blended with CK-3. The I. G. plant of Dynamit, A.G., is the largest German producer of primers for explosives and one of the largest producers of plastics, with a full line of nitrocellulose and vinyl compounds.

The Status of Synthetic Rubber Research and Polymer Evaluation. C. S. Marvel. (FIAT Final Report 618). PB 11193. 1945. 47 pages. Photostat $4; microfilm 50¢. The report covers a survey of recent research studies in synthetic rubber in Germany and is a result of interviews with representatives of the I. G. Farbenindustrie at Ludwigshaven, Huls, and Leverkusen, and of the Continental Gummi Works at Hannover. The most promising research leads discovered are the Buna 4 development and the Redox system of polymerization. Appendices to the report include: titration of internal and terminal double bonds of polymers of butadiene and its homologs with perbenzoic acid; definition of the K-value; heat sensitization of Buna latex with Igevin M-50; preparation of Buna solutions for viscosity measurements; comparison of GR-S *vs.* German Buna; and fractionation of Buna solutions. There is also a brief note by J. N. Street on experience with German-built synthetic tires.

Use of Synthetic Fibers in Rubber Tires at Continental Gummiwerke, Hannover. J. B. Quig and others. (FIAT Final Report 57). PB 13723. 1945. 4 pages. Photostat $1; microfilm 50¢. The experience of Continental, the largest producer of rubber products in Germany, with the use of synthetic fibers in tire making is given. It was found that the rayon available was inferior to that available in the United States, and that the use of synthetic reinforcing yarns with synthetic rubber left much to be desired. The same thing is true of the use of Perlon L for airplane tires, which was tried experimentally on a small scale.

Evaluation Report on Suit, Diving, Shallow-Water, Self-Contained, with Swim Fins, Italian. W. J. Matteson. (Army Engineer Corps. Engineer Board Rep. 2692.) PB 15593. 1945. 4 pages. Photostat $1; microfilm 50¢. The suit is made of rubber and consists of top and bottom sections cemented together after the wearer is dressed. A cloth suit is worn over the rubber to protect it. A self-contained air system is provided with a breather bag and a cylinder of oxygen, and rubber gloves and rubber swim fins are also furnished. Photographs are appended.

Proposed Synthetic Aircraft Tire Tests Nos. 4 5, 6, and 7. Lewis V. Coursen (AAF, Engineering Division. ENG-56-M4135, Add. VI.) PB 10106. 1943. 12 pages. Photostat $1; microfilm 50¢. Test No. 4 was conducted by the Army on cargo airplanes operating in the Yukon and Alaska, and covers S-5, S-6, and S-4 constructions in addition to possible tests on variations of GR-S polymers and their effect on low temperature performance. Test No. 5 covers S-4 construction. The Navy will test 54 x 9, S-6 tires, and the Army is testing 47-inch 12-ply rayon tires on B-25 airplanes. Test No. 6, by the Army, involves testing small sizes (30-inch S.C.) in the S-3 construction. Test No. 7 involves the testing of nylon cord tires in the S-5 construction.

Report of Tests on Captured Japanese Equipment Consisting of Three Weather Balloons. Rubber Laboratory, Mare Island Navy Yard. PB 12619. 1943. 3 pages. Photostat $1; microfilm 50¢. Physical tests were performed on captured Japanese weather balloons. Their physical properties were superior to those of United States Navy target balloons, except for weather aging characteristics.

Development of Synthetic Rubber Cement and Adhesive Fabric for Gas Mask Repair Kit, Company M2. Robert H. Helle. (Chemical Warfare Service Development Laboratory, Mass. Inst. of Technology, M.R. 197.) PB 7946. 1945. 68 pages. Photostat $5; microfilm $1. Two neoprene cements and a neoprene-coated adhesive fabric have been developed for use in the gas-mask repair kit on natural rubber, reclaimed rubber, and neoprene stocks. The materials do not adhere satisfactorily to proposed Butyl stocks. The natural tendency for neoprene compounds to cure, when subjected to moderately high temperatures, has been overcome in these products so that they are relatively stable. Experimental small plant batches have been made. Tentative specifications drawn up have been approved by OC, CWS. Tables are included.

The Determination of Particle Weights or Molecular Weights by Means of Combined Ultramicroscopic and Absorption Measurements in Cases Where the Total Concentration of the Light Scattering Substance is Unknown. (Polymer Research Branch, Research and Development Section, Rubber Reserve Co. RRC No. GR-18.) PB 9689. 1944. 7 pages. Photostat $1; microfilm 50¢. When a light scattering substance is in equilibrium with a chemically identical fraction of negligible light scattering, the fractional concentration of which is unknown, the Raleigh-Mie equation which expresses the relation between particle mass and refractive index becomes inconvenient as it contains two quantities: namely, R (integral radiation) and I_0 (primary intensity) that are not easy to determine. This paper shows that a transformation of the equation, introducing turbidity and absorption coefficient, makes it possible to calculate the particle mass by combined ultramicroscopic and photometric measurements. Technical report from the University of Chicago.

Procedure for the Characterization of Raw GR-S Polymers. G. E. Hulse and others. (Report of the Committee on Standardized Methods and Apparatus for Molecular Weight Determination of GR-S Polymers. WPB, General Report 4.) PB 9677. 1944. 11 pages. Photostat $1; microfilm 50¢. The characterization of raw GR-S polymers falls into three parts: (1) separation of sol from gel, and determination of percentage of gel; (2) characterization of gel by determination of swelling index; and (3) characterization of sol (intrinsic viscosity). The paper gives accepted standard apparatus and standard procedures for the performance of these three tests. It also gives the formulae by which the intrinsic viscosity can be deduced from the relative viscosity of the solution and shows how the approximate molecular weight can be calculated.

Performance of Synthetic Rubber Tires (30" S.C. Buna-S Tread with Reclaim and Natural Rubber Carcass). L. V. Coursen. (AAF, ENG-M-56-4135.) PB 10100. 1943. 12 pages. Photostat $1; microfilm 50¢. This report covers a study of the performance and life expectancy of synthetic rubber aircraft casings. Some 200 eight-ply rayon casings with Buna S treads and reclaim and natural rubber carcasses were procured and placed on AT-9 airplanes for service tests. The tires were found to be slightly superior to natural rubber tires used in the past.

Unsatisfactory Tire Performance at Langley Field. L. V. Coursen. (AAF, Experimental Engineering Section. EXP-M-56-3927.) PB 9787. 1941. 2 pages. Photostat $1; microfilm 50¢. An investigation was made of the large number of tire failures at Langley Field. It was concluded that 10-ply cotton tires are not strong enough for the B-26 airplane, and that 12-ply tires should be used. The TR-35 value was found to be inherently weak between the metal insert and the base of the valve. It was recommended that more rigid inspection of tires at the plant of the manufacturer be enforced.

Volume Swell Properties of Freeze-Resistant Synthetic Rubbers. P. J. Mahoney. (AAF, Engineering Division. ENG-56-M-4172. Add. 5.) PB 9810. 1943. 3 pages. Photostat $1; microfilm 50¢. It was found that "Thiokol" FA, Hycar OR, Perbunan, and Neoprene ILS have good resistance to aromatic fuel and fair to good freeze resistance properties. With the exception of "Thiokol" (not tested), they show excessive shrinkage on hot oil immersion. Neoprenes GN and GR have good freeze resistance and good resistance to the effects of hot oil, but show a high swell on aromatic fuel immersion. Buna S and Butyl have good freeze resistant properties, but are neither oil nor gasoline resistant. Both have excessive swell in aromatic fuel and hot oil.

Method for the Determination of Butadiene during Emulsion Polymerization. Method for the Determination of Free Styrene during Emulsion Polymerization. E. J. Meehan and I. M. Kolthoff. (WPB, General Report 1.) PB 9674. 1943. 8 pages. Photostat $1; microfilm 50¢. The indirect method for the determination of butadiene will give correct results only if the butadiene used for polymerization is completely volatile at 200 mm. Hg and 50° C. Furthermore conversions of butadiene based on this, or any similar, indirect method will always be too high because of the formation of butadiene dimer (vinyl cyclohexane) which is not volatile under the experimental conditions. With these limitations the method is believed to be precise to a few parts per thousand. A table showing results of the experiment and a flow sheet are included. The spectrophotometric analytical method for styrene described in the second report is simple, rapid, and accurate. The entire procedure of measurement and calculation does not require more than five minutes, if only one solution is being tested. The method is highly specific and free from interference by other latex constituents.

Procedures for the Determination of Gel Content, Swelling Index, and Dilute Solution Viscosity of GR-S Polymer. J. W. Mullen, II, and W. O. Baker. (WPB, General Report 8.) PB 9680. 1944. 7 pages. Photostat $1; microfilm 50¢. Report of work done at the Bell Telephone Laboratories. The essential components of the apparatus (drawings are included) are extraction cup, screen system for supporting polymer samples, heater rack, cooler cap, and extra cap. Operation depends on establishment of convection currents between heater around cup bottom and cooler at the top, which speed dissolution of the sol rubber and effect overall equilibration. The accuracy of the swelling index determinations is in the order of ±5%; of the gel content determinations, ±1%. The precision is considerably higher. With unusual care the above limits can be reduced, but are entirely adequate for control purposes.

Hard Rubber Tray. L. C. Smith. (AAF, Experimental Engineering Section, EXP-M-59-681-44-3.) PB 7149. 1942. 3 pages. Photostat $1; microfilm 50¢. This work was to determine the impact, tensile, and hardness properties of a sample hard rubber tray submitted by the photographic laboratory, Wright Field. The impact strength of the rubber averaged 0.355 ft. lbs./in. notch. The Rockwell "M" hardness averaged 24. The ultimate tensile strength averaged 2210 p.s.i., and the elongation range was 2-9%.

Performance of Non-Skid Tires, U. S. Rubber Co., S. C. 10-Ply Nylon Tires. L. V. Coursen. (AAF, Experimental Engineering Section. EXP-M56-3927, Add. II.) PB 9789. 1942. 3 pages. Photostat $1; microfilm 50¢. Forty-eight 10-ply nylon tires were purchased and installed on several B-26 aircraft. Pilots report satisfactory performance of the tires. A load-deflection curve is appended.

Proposed Testing Program for Synthetic Tires, Test Nos. 3A, 3B, and 3C. Lewis V. Coursen. (AAF, Engineering Division. ENG-56-M4135, Add IV.) PB 10103. 1943. 2 pages. Photostat $1; microfilm 50¢. This report records the plans for testing synthetic rubber tires for fighter aircraft. The test tires are sent to a training school and installed on a trainer-type airplane until no longer serviceable.

Snow and Ice Tire Performance. L. V. Coursen. (AAF, Experimental Engineering Section. EXP-M-56-3927, Add. I.) PB 9788. 1942. 4 pages. Photostat $1; microfilm 50¢. This report discusses the performance of the snow and ice tires manufactured by United States Rubber Co. and concludes that the tires are satisfactory. Photographs are included.

(Continued on page 690)

RUBBER WORLD

NEWS of the MONTH

Highlights—

The Rubber Study Group at its Paris meeting, in addition to recommending to the governments concerned that they do something about the low price of natural rubber, decided to establish a permanent secretariat with headquarters in London. The Army-Navy Munitions Board proposals for rubber legislation, as submitted to Representative Shafer's House Armed Services Subcommittee on Rubber, were not received with much enthusiasm by either the Subcommittee or the rubber goods industry. Rubber Order R-1 was revised to permit the use of natural rubber in additional products, and a further revision is expected in August which will establish natural and synthetic rubber consumption on about a two-to-one basis. Production in the various branches of the rubber goods industry was spotty, but except for vacation and inventory shutdowns had not dropped very much below the peak May rate. The URWA voted to open the March 22, 1947, wage agreement after July 22 and to request a further wage increase for its members to compensate for the increase in the cost of living since January 1, 1947. Attempts of the URWA local unions at the plants of The B. F. Goodrich Co. to obtain a company-wide working conditions contract were unsuccessful, and a strike vote was taken by these local unions during July.

Study Group Urges Natural Rubber Price Support; ANMB Proposed Legislation Objected to by Industry

The fourth meeting of the International Rubber Study Group, held in Paris, France, during the first week of July, issued a release at the end of the meeting indicating plans for enlarging the membership of the Group, increasing the consumption of natural rubber, and urging support of the falling price for natural rubber by the governments concerned. The Army-Navy Munitions Board submitted a report and proposed long-term legislation on rubber to the House Armed Services Subcommittee under Rep. P. W. Shafer. The legislation was criticized by Representative Shafer and industry spokesmen as not acceptable because it increased rather than decreased the extent of the participation of the government in the rubber business for an indefinite period. Rubber Order R-1 was revised last month, and another revision is scheduled for August. Production in the rubber goods industry was variable, but generally at quite a high level except for vacation and inventory shutdowns.

Paris Rubber Conference

The Rubber Study Group held a meeting in Paris the first week of July. A press release under the date of July 9 announced that the fourth meeting of the Rubber Study Group, held under the chairmanship of Georges Peter, Director of Economic Affairs at the Ministry of France Overseas, ended on July 8. The meeting was attended by delegates from: Australia, Belgium, Bolivia, Canada, Ceylon, Denmark, Ecuador, United States, France, Hungary, Italy, Liberia, Norway, Holland, United Kingdom, British Colonies, Siam, Czechoslovakia, and Venezuela, and by observers from: Brazil, Colombia, Finland, Guatemala, Mexico, Poland, Portugal, Sweden, Switzerland, the United Nations Organization, and the Food and Agriculture Organization.

The principal objects of the meeting were: (1) to consider the organization of the enlarged group; (2) to view the world rubber situation in the light of changes since the previous meeting, held at The Hague in November, 1946.

The Study Group adopted a resolution recommending that participating governments accept new terms of reference, of which the principal features are: (1) that membership shall be open to all countries substantially interested in the production, consumption of, or trade in, rubber; (2) that the Group shall consider measures designed to expand world consumption of rubber; (3) that the Group shall consider how best to deal with any special difficulties which may exist or may be expected to arise and may submit recommendations on the subject to the participating government; (4) that the Group shall maintain such secretariat as it may deem necessary for the proper conduct of its work and shall arrange for the collection and dissemination of statistics.

For the purpose of facilitating the establishment of a permanent secretariat, the Study Group has recommended unanimously to the participating governments the setting up as soon as possible of a committee to supervise the establishment and work of the secretariat, the following members to be represented, in the first instance, on the management committees: France, Netherlands, United Kingdom, and United States. The question of the membership of the management committee will be examined at the next meeting, it was stated.

It was agreed that the permanent site of the secretariat should be in London, England.

The group examined the current statistical position, but because of the many imponderables which now affect the situation refrained from making any firm estimates for supply and demand beyond the end of 1947. During 1947, as far as could be foreseen in present conditions, it was estimated that production of natural rubber will be about 1,200,000 tons and of synthetic rubber about 515,000 tons. The total consumption of natural rubber is esitmated at just over 1,060,000 tons and of synthetic rubber at 585,000 tons. These figures do not include any estimates for Russia except in respect to imports of natural rubber.

If these estimates are realized, stocks of natural rubber at the end of 1947 will be 140,000 tons higher than at the end of 1946, and stocks of synthetic rubber 70,000 tons lower. Both the United States and United Kingdom Governments are at present holding substantial stocks of natural rubber, and these should be taken into account in looking at the overall stock position.

The Rubber Study Group noted with great concern the downward trend in the market price of natural rubber and decided to recommend that the governments concerned should consider, as a matter of urgency, what action they are in a position to take to meet this special difficulty.

The Group considered what action could be taken to expand world consumption of rubber. It hoped that no avoidable obstacles would be placed in the way of international trade in and the use of rubber, and that maximum assistance should be given to the countries desiring to make an extensive use of rubber, but which, on account of the war, cannot afford to pay in foreign currencies for the rubber imports they require, the release concluded.

W. S. Lockwood, in his July 15 "Rubber Report," attached especial significance to the last two paragraphs of the Rubber Study Group press release: namely, the recommendation that action be taken to support the falling prices of natural rubber and that "no avoidable obstacles be placed in the way of international trade in and the use of rubber." He indicated that he felt the formal expression of concern over the price drop should serve its obviously intended market-bolstering purpose and that United States agreement with the clause against "avoidable obstacles" is a healthy sign in the field of international economic relations.

As far as the future is concerned, according to Mr. Lockwood, much will depend on the subsequent interpretation by both consumer and producer countries of the word "avoidable." Whether we can *avoid* too great compulsory consumption of synthetic rubber for national security purposes, and whether producers can *avoid* too hasty production restriction for ecomic security purposes, remain to be seen.

Statements of rubber growers complaining about their difficulties in rubber production were included in newspaper comments on the Study Group meeting. One pointed out that the cost of labor is 70% of the cost of producing natural rubber and that rubber workers' wages are more than double prewar. With the price of rubber 15% below 1939 in New York, a bad situation for the grower has developed. Workers in rubber countries are disgruntled and indifferent. Even with their higher wages, they can obtain much less than prewar in food and clothing. Production on small estates dropped more than 50% between March and May as small growers turned to the production of food instead of rubber. Another grower complained that the cost of equipment for tapping 300 trees was $7 in 1941 and is $57 today.

Sir John Hay, at a meeting of one of the estate companies in England on June 16, said in part: "In the producing territories there are now no restraints on production or shipment, but in the main consuming country, namely, the U. S. A., there is, however, now in force an extreme form of restriction on the use of natural rubber and on the quantity of stock that may be held by any consumer. This is accompanied by the enforcement of the use of domestically produced synthetic substi-

tute in specified proportions over a wide range of manufactured articles. It is significant that, in a country which is regarded as the stronghold of free enterprise and non-Government interference with trade, these measures should have the support of the industry itself which in the past has professed to be shocked by the much milder regulatory steps introduced on the producers' side in circumstances when the need for such a measure was indisputable if economic disaster was to be avoided."

Negotiations between the Netherlands Government and the Indonesian Republic relative to the gradual establishment of self-government under the terms of the Agreement of Linggadjati, were terminated on July 20 on the basis that the Republic was unable to implement the Agreement. The Dutch Colonial Government began large-scale military operations following the issuance of several Dutch ultimatums, setting time limits on Republican acceptance of certain Dutch proposals. The campaign was undertaken to restore law and order, and by July 25 all of eastern Java had been pinched off, and fighting there had ceased. With the capture of the port of Cheribon, most of western Java was either occupied or being mopped up by Dutch troops. Fifty thousand tons of rubber were reported seized in Cheribon.

The price of rubber on the New York market rose 3¢ a pound with the renewal of fighting in Netherlands India. However, if the Dutch succeed in extending their control over larger portions of Java and Sumatra, a considerable increase in the amount of rubber available from this area might result, and this possibility seemingly was anticipated during the latter part of the week of July 21 when the price dropped 2¢ a pound from the earlier high of about 17.5¢ a pound.

R-1 Revised

A revision of Rubber Order R-1 was announced on July 14 by the Office of Materials Distribution, United States Department of Commerce. No substantial changes in the ratio of natural and synthetic rubber consumption, however, were made; the changes in the order dealt principally with simplification of controls, procedures, and reports.

It was pointed out in connection with this revision that Public Law 24 provides that as rapidly as the supply and demand situation permits, controls over rubber will be primarily to provide for the use of synthetic rubber, rather than to restrict natural rubber to certain products. This revision and future amendments represent the machinery to carry out the intent of the law, it was said.

Further revision of R-1, including appendices 1 and 2, is now under study, and it is anticipated that provisions for the use of minimum quantities of synthetic rubber considered necessary to national security will become effective early in August. This August revision is expected to reduce mandatory consumption of GR-S from the present ratio of approximately 42% GR-S of the total of natural plus GR-S to 33 1/3% GR-S of the total natural plus GR-S.

Another report on July 22, attributed to Department of Commerce officials, stated that based on present specifications of R-1, consumption of natural rubber was estimated as 138,000 long tons in the second quarter of this year and should be 126,000 tons in the third quarter and 129,000 tons in the fourth quarter. Total stocks of natural rubber held in this country will steadily increase between now and next year, climbing from the current inventory figure of about 389,000 tons to 449,000 tons on April 1, 1948. The percentage of natural rubber in total United States rubber consumption ranges near 49% now and will increase to about 61% natural as against 39% synthetic (of all types) by the end of this year, it was predicted.

Rubber Policy Progress Slow

A lengthly report of the Army-Navy Munitions Board containing recommendations for a long-term rubber policy was submitted to the House Armed Services Subcommittee on Rubber on July 10. The report, supposed to have contained the recommendations of both the government agencies concerned and industry members of the advisory committee, apparently did not include many industry recommendations. A few days later, John L. Collyer, head of The B. F. Goodrich Co. and chairman of the ANMB industry advisory committee, notified the Board that industry is vigorously opposed to the recommendations of the report which are incorporated in the form of proposed legislation as the "Rubber Act of 1948."

Mr. Collyer stated that industry leaders, after analyzing the ANMB bill, had agreed:

"That the proposed bill is not acceptable in that it sets up in a government bureau broad control for an indefinite period in respect to the use of crude and American-made rubber.

"That the rapidly changing rubber situation strongly indicates that no long-term legislation should be considered at this time, but that the temporary legislation (Public Law 24) should be continued, amended if need be in view of changed conditions since it was passed, but in any event continued until March 31, 1948, and possibly for a definite short period thereafter.

"That the sale of the government of GR-S during the short supply period ahead should be at a price which covers full cost, but allowing for the fact that the plants, though built at excessive wartime costs, have already been fully depreciated."

According to Mr. Collyer, the majority of the rubber industry believes that free play of economic forces will do more than anything else to spur development of all types of rubbers, broadening of their usefulness, and the manufacture of more and better rubber products at lower costs.

The industry further objects to the bill because it sets up mandatory use of general-purpose rubbers, requiring use in tires, camelback, and other products in accord with a specified formula.

The ANMB bill, scheduled to be considered by Congress after it reconvenes in January, has the following provisions:

1. Minimum consumption of synthetic rubber (about 300,000 long tons a year) to provide for sufficient production capacity to meet the needs of national security.

2. Mandatory usage of synthetic rubber to assure this minimum consumption.

3. The requirement that one-third of the estimated total general-purpose synthetic and natural rubber shall be general-purpose synthetic rubber, and that 4% of the estimated total new rubber consumed shall be synthetic rubber of the Butyl type suitable for manufacture of automotive inner tubes.

4. A government agency (National Rubber Council) shall be established to administer the policy. This council would be composed of the Secretary of Commerce as chairman and the Secretaries of War, Navy, and State. A Rubber Administrator, serving two years at $12,500 a year, would be appointed by the Secretary of Commerce.

5. Transfer of all natural rubber stocks presently in the hands of the Reconstruction Finance Corp. to the permanent strategic stockpile.

6. Sale or lease of the government-owned synthetic rubber plants to private industry at the earliest practicable date.

7. The operation of standby facilities so that the total active and standby capacity is at least 600,000 long tons a year of general-purpose synthetic rubber (GR-S).

Richard R. Deupree, ANMB chairman, revealed that the Board had rejected the advisability of a subsidy plan to support the synthetic rubber industry. A subsidy would cost the government about $85,000,000 a year. It was proposed that a subsidy of 9½¢ a pound be paid with the cost of GR-S to the consumer being 9¢. This would mean an annual subsidy of about $68,000,000. A subsidy of 3¢ a pound for excessive damage to the reclaimed rubber industry by virtue of the use of GR-S instead of reclaimed rubber would total about $17,000,000.

The government agencies, it was said, could see no need of subsidy of any kind or of tariff or limited imports. They prefer to have mandatory usage rather than any sort of subsidy.

Lockwood's July "Rubber Report" stated that for discussion purposes he had taken the following position on rubber policy:

1. There should be provided a national rubber stockpile of from a minimum of 800,000 tons to a maximum of 1,000,000 tons of natural rubber. The purchase of this stockpile should be expedited by government and industry pressure on Congress to provide the necessary funds speedily so that advantage can be taken of present low natural rubber prices. Purchases for stockpile, above the minimum required by the Armed Services at any price, should be made up to a certain variable adjustable maximum fixed price. When the price rises beyond this point, because of purchases for stockpile or for other reasons, buying should be relaxed until it is again possible to purchase at an attractive price.

2. There should be no compulsory use of synthetic rubber after March 31, 1948. Compulsory use of GR-S on a work-away basis lessens the incentive to produce a better all-purpose synthetic rubber. The American consumer pays more than necessary for his rubber products. Compulsory use entails the probable necessity of a government agency controlling the rubber manufacturing business for a long period of time. Compulsory use is definitely contrary to the policies of freer international exchange of goods advocated by this country at Geneva.

The feature article in Lockwood's July "Rubber Report" was entitled "Synthetic Rubber—Protected or Free Industry?" and was written by Ralph F. Wolf, technical director, Harwick Standard Chemical Co., Akron, O. It is reprinted on page 641. Mr. Wolf takes the position that natural and synthetic rubber should be permitted to compete with each other on merit and cost without artificial advantage given either type of rubber. This competition will stimulate development of better and cheaper synthetics, and while this is coming to pass, there need be no fear of natural rubber prices getting out of hand, it was said. The threat of potential synthetic production will prevent this from occurring even though not a single pound of synthetic is actually being produced. Mr. Wolf pointed out that the copolymer plants, being comparatively simple, can be readily placed

in standby condition while the raw material plants will continue in operation, perhaps producing other hydrocarbons, but always ready to make synthetic rubber raw materials if it is ever necessary to combat an attempted price gouge by natural producers or to supply the needs of the country if it is ever again cut off from the sources of natural rubber.

Meanwhile Senator Chapman Revercomb of West Virginia, in a speech before the Veterans of Foreign Wars in Wheeling, W. Va., on June 27, called upon the Administration to reconsider its policy on rubber imports "so that the great American synthetic rubber industry, which was developed during the war, will not be forced out of business, with resulting unemployment for thousands of workers." Senator Revercomb urged that the ratio of synthetic to natural rubber in American rubber products be maintained on a 50/50 basis instead of the two-thirds natural/one-third synthetic now being proposed.

Rep. P. W. Shafer, chairman of the House Armed Services Subcommittee, in commenting on the ANMB proposed bill said that the members of his subcommittee do not favor the establishment of a government bureau that will control the rubber industry with volumes of red tape and regulations, necessitating expensive bookkeeping and endless reports. He deplored the failure of the ANMB bill to include recommendations of the rubber industry, pointing out that since the industry must live with the legislation, it is important that the industry be satisfied with it.

He said that Congress must decide how much synthetic rubber shall be produced domestically each year. Present estimates run from 100,000 to 300,000 tons. Congress must also decide whether the use of synthetic rubber shall be made mandatory under end-use specifications, or whether some form of subsidy should be approved to guarantee production of a suitable amount of synthetic rubber.

It was stated that the subcommtitee will make a tour of the synthetic rubber plants during the summer and hold further hearings on rubber legislation in the fall.

Industry Production Outlook Variable

The production picture for the rubber goods industry as a whole during July was spotty. Of course shutdowns for vacations and inventory taking will reduce output for the month and will make it difficult, if not impossible, to judge whether the basic production is on the downgrade.

According to one report, lay-offs of rubber workers, including production and maintenance employes, have amounted to 8,000 in Ohio, western Pennsylvania, and western New York since the first of the year. These employment declines, however, are reported to have occurred in companies manufacturing goods other than tires. It was indicated in one report that still greater employment declines in the third and fourth quarters of the year may be expected since tire production schedules for the last half of the year are about 25% lower than for the first half.

On the other hand, published statements attributed to spokesmen for the Goodyear, Goodrich, Lee, General, and Seiberling companies were very optimistic for continued high-level production of tires for the remainder of the year.

The RMA report on shipments of tires by manufacturers during May stated that shipments of passenger-car tires exceeded those for April by 0.5%. Production of passenger-car tires was at a rate about 3% lower than for April. Shipments of truck and bus tires were 1.5% below April, and production was about 3% lower. Stocks of passenger-car tires at the end of May totaled 5,038,888, as compared with 4,399,795 in April, and the inventory of truck and bus tires for May was 1,387,002, as compared with 1,208,353 at the end of April. The complete report follows.

In a published statement, W. C. DeGenring, general sales manager of the Hood Rubber Co., division of Goodrich, predicted that the buying of rubber footwear in the coming year will equal the record season just completed. During the past year rubber footwear purchases were 50% greater than in any previous year in a 20-year period, and this strong buying demand is continuing with no sign of let-up, it was said.

Synthetic rubber will continue to be used extensively in rubber footwear lines, and the new styles and colors for the fall season are now being exhibited.

In soles and heels, factories depending on the old staple lines are not very busy; while others with specialty items are doing very well, it has been reported. Shoe factories and jobbers generally are still buying only for their immediate needs, and inventories are being kept low. If and when crepe of good quality and at a favorable price is available, a considerable increase in the production of crepe soles is anticipated. Shoe manufacturers have been anxious to obtain these soles for months. It is understood that in the coming year shoe manufacturers will demand a wide variety of colors in soles and heels, which may add considerably to the production problems of the sole and heel industry.

The coated materials branch of the rubber industry is believed to be maintaining a high production rate, but is not too optimistic about continuing at the present level for the remainder of the year.

According to the Office of Materials Distribution, consumption of rubber during May was as follows: natural, 43,098 long tons (including 681 tons of latex); GR-S, 39,622; neoprene, 2,837; butyl, 5,874, nitrile types, 330 long tons. Total consumption of both natural and synthetic types was 91,761 long tons.

New supply and production of these rubbers totaled: natural, 81,909 long tons (including 640 tons of latex); GR-S, 39,069; neoprene, 2,906; Butyl, 7,160; nitrile types, 612.

Stocks on hand at the end of May were reported as: natural, 331,781 (including 4,850 tons of latex); GR-S, 75,682; neoprene, 7,025; Butyl, 20,255; nitrile types, 3,886.

Tire Industry Investigation

The House Small Business Committee has urged the Federal Trade Commission to undertake a joint investigation of the tire industry with the Justice Department's Antitrust Division. The FTC will handle the problems of unjustifiable price concessions to mass purchasers; while the Antitrust Division will handle other phases of the tire monopoly problem.

In a letter to Rep. Walter C. Ploeser of Missouri, Robert E. Freer, acting chairman of the FTC, disclosed that a resolution had been adopted "authorizing an investigation of the rubber tire industry for the purpose of ascertaining whether conditions in that industry would warrant the Commission taking formal action as provided for under Section 2 of the Clayton Act . . . . for fixing and establishing quantity limits."

The FTC is the only agency with the power to establish such quantity limits so as to prevent price discounts which are "promotive of monopoly." Mr. Freer pointed out that FTC planned to send a questionnaire to tire manufacturers and mass distributers which would develop information as a basis for further action. The Commission expects that there will be the least possible duplication of information requests on industry as a result of cooperative arrangement with the Antitrust Division.

Pacific States Rubber Co., 644 N. Vermont Ave., Los Angeles, Calif., will erect a warehouse and printing building. The one-story concrete block structure will cost $6,500.

ESTIMATED AUTOMOTIVE PNEUMATIC CASINGS AND TUBE SHIPMENTS, PRODUCTION AND INVENTORY—MAY, 1947, APRIL, 1947,—FIRST FIVE MONTHS 1947 AND 1946

	1947				
	May	% of Change From Preceding Month	April	First Five Months	1946 First Five Months
PASSENGER CASINGS					
Shipments					
Original equipment	1,602,785		1,463,713	7,969,382	2,816,992
Replacement	4,097,022		4,240,834	21,450,222	22,294,918
Export	189,652		154,617	698,034	211,013
Total	5,889,459	+0.52	5,859,164	30,117,638	25,322,923
Production	6,525,781	—2.76	6,711,133	33,527,870	25,812,107
Inventory end of month	5,038,888	+14.53	4,399,795	5,038,888	2,386,483
TRUCK AND BUS CASINGS					
Shipments					
Original equipment	402,075		430,390	2,447,662	1,328,068
Replacement	820,455		822,063	4,051,382	4,730,854
Export	171,335		161,804	690,523	311,339
Total	1,393,865	—1.44	1,414,257	7,189,567	6,370,261
Production	1,578,322	—2.70	1,622,109	7,909,968	6,587,262
Inventory end of month	1,387,002	+14.78	1,208,353	1,387,002	990,759
TOTAL AUTOMOTIVE CASINGS					
Shipments					
Original equipment	2,004,860		1,894,103	10,417,044	4,145,060
Replacement	4,917,477		5,062,897	25,501,604	27,025,772
Export	360,987		316,421	1,388,557	522,352
Total	7,283,324	+0.14	7,273,421	37,307,205	31,693,184
Production	8,104,103	—2.75	8,333,242	41,437,838	32,399,369
Inventory end of month	6,425,890	+14.58	5,608,148	6,425,890	3,377,542
PASSENGER AND TRUCK AND BUS TUBES					
Shipments					
Original equipment	1,979,664		1,897,203	10,387,443	4,144,764
Replacement	3,267,955		3,510,266	19,592,642	22,143,347
Export	323,235		323,640	1,264,757	498,095
Total	5,570,854	—2.80	5,731,109	31,244,842	26,786,206
Production	5,752,429	—18.90	7,093,113	37,326,808	28,055,179
Inventory end of month	9,771,746	+3.08	9,479,659	9,771,746	4,373,316

NOTE: Cumulative data on this report include adjustments made in prior months.

Industrial Relations News

The policy committee of the URWA, meeting in Cleveland, O., in July voted to reopen its wage agreement with the Big Four rubber companies. The union will negotiate with the Big Four on whatever basis can be worked out under the March 22, 1947, agreement, it was stated. A strike vote was taken at the various plants of The B. F. Goodrich Co. when negotiations between the company and the union for a new contract on working conditions were broken off in mid-July. The union is seeking a uniform contract covering working conditions for employes in seven Goodrich plants, and the company refused to bargain on a company-wide basis. Wage agreements were signed by Viceroy, Gutta Percha, Seiberling, and Firestone, all in Canada, during the month.

Big Four Wage Issue

Delegates from 41 local unions in plants of the Goodrich company, Goodyear Tire & Rubber Co., United States Rubber Co., and Firestone Tire & Rubber Co. met with international URWA union officers and the general executive board of the union in Cleveland in mid-July and voted to ask for a wage increase sufficient to meet the rise in living costs between January 1, 1947, and the time an agreement is reached, plus whatever is necessary to equal other wage patterns established in 1947.

The agreement of March, 1947, between the rubber companies and the union, which provided for an 11½¢-an-hour increase, effective February 2, 1947, provided for a reopening of the wage agreement four months after March 22, conditional upon 15 days' notice being given by either party.

The rubber industry is considered to be in a strong position to resist extreme demands by the union with inventories of tires and other rubber goods now at a high level. If a strike developed, it is not expected that it would immediately affect the production of new automobiles. It is quite likely that the companies will point out to the union that consumer resistance and recently reduced prices of tires and other goods make it impracticable to raise wages at this time. If production and employment are to be maintained at present high levels, a continuation of present low prices is essential.

Goodrich Contract Difficulties

Local URWA unions at seven Goodrich plants took strike votes during July after negotiations with the company for a new contract covering working conditions on a company-wide basis were unsuccessful. At the Akron, O., plant the vote was 15 to 1 in favor of a strike. If a strike is called, it is expected to take place before August 22, when certain provisions of the Taft-Hartley Labor Law governing strike action become effective. A strike after August 22 would have to be approved by the new National Labor Relations Board, and the Board is bound by law to order a cooling-off period of 60 days. The executive board of the URWA union has instructed all local unions not to make use of the new NLRB.

The company distributed bulletins to all employes telling them why a company-wide contract could not be negotiated. The local plant management of each of its plants assumes full and complete responsibility for the results of that particular plant, and this practice naturally requires that the local management be given full authority to act on its own initiative and best judgment in handling management functions of broad scope, the company explained.

The union arguments for a company-wide contract emphasized the greater ease and time savings in conducting negotiations, greater uniformity in contract provisions, improved union-company understanding, and greater assurance of local union responsibility.

Canadian Company Negotiations

All but three of the major rubber companies in Ontario have reached agreements on a new wage scale with the URWA. Most of the agreements are based on a wage increase of 9¢ an hour across the board, plus three additional paid holidays and two weeks' holiday after five years' service. The latest agreement was signed by Viceroy Mfg. Co., Ltd., Gutta Percha & Rubber, Ltd., and Seiberling Rubber Co. of Canada, Ltd., all of Toronto, Ont., and Firestone Tire & Rubber Co. of Canada, Ltd., Hamilton, Ont.

The employes of Dominion Tire & Rubber Co., Ltd., Kitchener, Ont., rejected an offer of a 9¢-an-hour increase, but the employes of the company's textile division accepted the offer retroactive to June 30. The textile division agreement also provides for three additional paid holidays, bringing the total to six, and two weeks' vacation with pay after five years' service.

Rubber Restrictions Eased

Revision of Rubber Order R-1, effective immediately, was announced July 14 by the Office of Materials Distribution, United States Department of Commerce, Washington, D. C. Changes deal principally with simplification of controls, procedures, and reports. No substantial changes in the ratio of natural and synthetic rubber consumption are made.

New provisions eliminate all allocation and inventory controls over GR-S and GR-I and establish a simplified method of acquiring natural rubber from government stocks during the present calendar quarter. Included is a provision permitting the consumption of natural rubber, to the extent of 10% of hydrocarbon content by weight, in all products which previously had been permitted no natural rubber. A new procedure is outlined for the use of natural latex to the extent that the supply permits. This last is a step toward elimination of quantitative controls over natural rubber latex. Special limitations on the use of pale crepes of any type are removed, as the result of increased supply and the availability of certain amounts from government stocks. Small companies using relatively small amounts of natural and synthetic rubber no longer are required to report.

Use of natural rubber or natural rubber latex is permitted in several additional product groups. Automotive and aircraft hose, and grommets may be manufactured with 25% of natural rubber. Laboratory stoppers and dress shields are placed on a two-thirds natural - one-third synthetic rubber basis. Cements for any purpose may contain two-thirds natural and one-third synthetic latex, and balloons may be made in the same proportions. Bearings for deep well pumps may be produced as the manufacturer wishes.

Consumption of additional natural rubber is allowed in a number of other product groups. In the relatively new and growing latex foam products field, manufacturers now may use as much as two-thirds natural latex. Previously they were limited to half natural latex and half synthetic in the production of these items.

In March, 1947, Congress enacted Public Law 24, providing for interim controls over rubber until March 31, 1948, or until Congress may enact legislation to assure maintenance of a synthetic rubber producing industry that will afford national security in any future emergency. Public Law 24 provides that as rapidly as the supply and demand situation permits, controls over rubber will be primarily to provide for the use of synthetic rubber, rather than to restrict natural rubber to certain products. When this law was enacted, it was estimated that natural rubber would be in adequate supply within a few months. The above revision of R-1, and future amendments represent the machinery to carry out the intent of the law, officials of OMD's Rubber Division explained.

Further revision of the rubber order, including Appendices I and II, is now under study, and it is anticipated that provisions for the use of the minimum quantities of synthetic rubbers considered necessary to national security will become effective early in August.

Chemical Industries Exposition

Widespread interest has developed in the Twenty-First Exposition of Chemical Industries, denoting unusual activity in industrial planning. Although the Exposition will not be held until December 1 to 6, space reservations already assure the complete occupancy of four floors of Grand Central Palace, New York 17, N. Y.

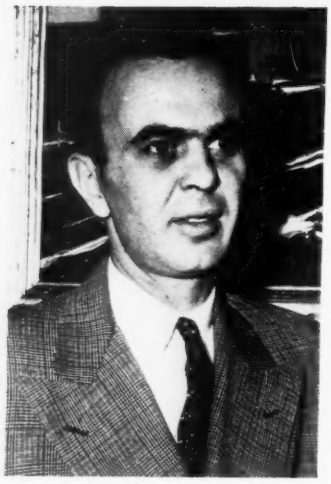
Two noteworthy factors in the outlook are the increased number of inquiries from prospective exhibitors being received by the managment, and the greater number of former exhibitors making applications for more space than heretofore. There will be an increase in the exhibits of chemicals, and the display of processing equipment will be more comprehensive than usual, with many new developments to be disclosed. Equipment suitable for some part of almost every kind of manufacturing plant will be found among the exhibits.

As heretofore, only accredited visitors will be admitted to the Exposition under the invitation and registration system of attendance control. Charles F. Roth is manager of the Exposition, and E. K. Stevens is associate manager.

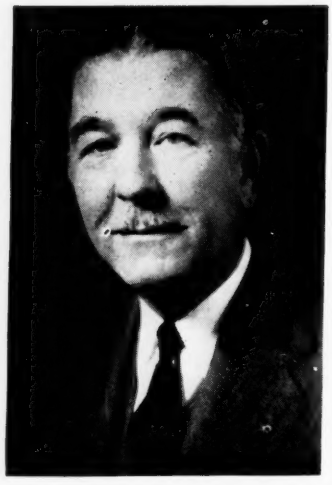
Controllers Institute of America, 1 E. 42nd St., New York 17, N. Y., recently elected to membership Herman V. Gaertner, controller, The B. F. Goodrich Co., and Claude A. Pauley, controller, The Firestone Tire & Rubber Co., both of Akron, O.

Tire Rebuilders News, 381 Fourth Ave., New York 16, N. Y., starting with the August issue is changing its name to *Tire, Battery & Accessory News* in recognition of the more diversified activities of the tire dealer and recapper.

EASTERN AND SOUTHERN



Harold C. Anderson



W. I. Galliher

Thermoid Advances Anderson

Harold C. Anderson has been elected vice president of research engineering and development of the Thermoid Co., Trenton, N. J., it was announced by Fred E. Schluter, president of the firm, following a directors' meeting. A graduate of the engineering school at Iowa State College, Mr. Anderson joined Thermoid in November, 1945, at that time taking charge of development phases of the company's new rubber program. In April, 1946, he assumed complete charge of development. During this time he was responsible for several major developments in Thermoid's automotive, industrial, oil field and textile products.

Prior to joining the company, the new vice president had been associated with the Flintkote Co. as assistant general manager for industrial products and previously had held important positions with both the Chrysler and the Ford organizations in research engineering and development capacity.

Commenting on the appointment, President Schluter stated: "Thermoid's broad plans for expansion, the diversity of its products and the decentralization of its production necessitated the addition to the board of competent research engineering counsel. Mr. Anderson was selected because of his wide experience in the industrial and automotive fields, and we regard his election to the new post as an important addition to Thermoid's top management."

M. L. Crossley, director of research for American Cyanamid Co., New York 20, N. Y., since 1941, recently was given the honorary degree of Doctor of Science by Wesleyan University, Middletown, Conn. Dr. Crossley, a graduate of Brown University, where he received the degrees of Ph.B., Sc.M., Ph.D. and Sc.D., joined the Calco Chemical Division of American Cyanamid in 1918 as chief chemist and became research director in 1936. Dr. Crossley was head of the department of chemistry at Wesleyan in 1917.

Promotions at Pittsburgh Plate

Pittsburgh Plate Glass Co., 632 Duquesne Way, Pittsburgh 22, Pa., has appointed George E. Dewey general personnel director concerned with personnel recruitment, training, and development; salary and wage administration; and other phases of industrial relations not directly connected with collective bargaining and grievance procedures. Associated with the Standard Oil Co. of Indiana for 17 years, Mr. Dewey joined that firm as a research engineer and later organized its technical information division. During 42 war months, Mr. Dewey was on leave to serve as labor counseler to the Petroleum Administration for War. In October, 1945, he returned to Standard as director of research in industrial relations. He attended Purdue University and is a graduate of the Colorado School of Mines and a member of the American Chemical Society, the American Management Association, and the Chicago Personnel Association.

George D. McClaren, associated with the Pittsburgh Plate industrial relations department during the past three years, will serve as assistant general personnel director. Mr. McClaren will be engaged primarily in plant and field contacts throughout the country.

To correlate the sales activities of the Columbia Chemical Division of Pittsburgh Plate Glass Co. and the Southern Alkali Corp., W. I. Galliher has been appointed executive sales manager of both units, according to E. T. Asplundh, vice president in charge of the Columbia Chemical Division. Southern Alkali, a subsidiary of the Pittsburgh firm, maintains sales branches in New York, Dallas, Houston, and Corpus Christi.

Associated with Columbia Chemical since 1931, Mr. Galliher for 12 years was director of sales for the division's heavy industrial chemical products. He has served as Columbia's executive sales manager since January, 1943. As executive sales manager for both Columbia Chemical and Southern Alkali, Mr. Galliher will maintain his headquarters at Fifth Ave. and Bellefield St., Pittsburgh.

Robert M. Simpson has been appointed acting district manager for the Chicago territory for Columbia Chemical, with headquarters in the Tribune Tower Bldg. A native of Little Falls, N. Y., Mr. Simpson is a graduate of Cornell University with a degree of A.B. in chemistry. He has been associated with the Columbia Chemical Division since 1944.

Changes at du Pont

E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., has announced the retirement on June 25, the thirtieth anniversary of his employment by the company as a research chemist, of Ernest B. Benger, noted research director and authority on synthetic fibers and films. Dr. Benger, 61, was manager of the rayon technical division, which has extensive research laboratories at the du Pont experimental station at Wilmington and at Buffalo, N. Y., and at Richmond and Waynesboro, Va. For many years his research activities were identified with development work on coated films, plastics, rayon, and nylon.

Succeeding Dr. Benger as manager of the rayon technical division is Andrew E. Buchanan, Jr., assistant manager of the division since 1944. Mr. Buchanan, who was born in Philadelphia, Pa., 49 years ago and graduated from Lehigh University in 1918, as a chemical engineer, first was employed by du Pont that year and spent four years in various plants of the chemical department. Then he became assistant editor of *Chemical and Metallurgical Engineering*, followed by several years' service in the Lehigh Alumni Association. He joined the du Pont affiliate, Remington Arms Co., in 1938 and earned several promotions there before transferring to the rayon technical division.

Willis F. Harrington, effective August 1, resigned as a member of the du Pont executive committee and as a vice president of the company, but will continue as a director, the du Pont board reported July 21. Mr. Harrington began his career with the company in 1904 as a chemist and won many promotions, becoming a director in 1927 and a vice president and member of the executive committee two years later.

To fill the vacancies caused by this retirement J. Warren Kinsman, general manager of the fabrics and finishes department, was named a vice president and on the executive committee. Mr. Kinsman, who was born in Elizabeth, N. J., in 1894, attended Battin High School and Wesleyan and Columbia universities. He joined the company in 1915 as a general foreman of the high explosives operating department at Bayway, N. J. Two years later, after a short period in the "Fabrikoid" department, the new vice president was transferred to the sales department at the former du Pont Chemical Works in New York, both of which later were incorporated into the fabrics and finishes department. The next year Mr. Kinsman went to the Carney's Point plant as an assistant supervisor and at the end of the first World War returned to the sales department of the Chemical Works. In 1921, however, he was appointed special assistant in the dyestuffs department; in 1924 assistant director of sales of the department; in 1929, director of sales for the organic chemicals division; and in 1931, director of sales for intermediates and exports and also manager of the alcohol division of the newly

formed organic chemicals department. Then in 1941, Mr. Kinsman was made assistant general manager of the plastics department and two years later was transferred to the same position in the organic chemicals department. In 1944 he became general manager of the fabrics and finishes department and was elected a director in 1946.

Improved White Sidewalls

White-sidewall neoprene tires that stay white longer without sun-checking or cracking are now available as a result of extensive tests made by du Pont. Neoprene sidewalls and sidewall veneers eliminate the harmful effects of the sun and of radial cracking, reduce sidewall cutting and wear, and end the aged and dirty appearance which soon showed up on prewar white-sidewall tires. This same protection is provided by neoprene in both black and white sidewalls. White neoprene stocks discolor slightly when exposed to strong sunlight, but if the neoprene is blended with an equal amount of pale crepe in the proper compound, protection against sun-checking is retained without objectionable discoloration. Identical neoprene and natural rubber tires were given a five year continuous service test in alternate positions on the same car. The natural rubber sidewall showed the usual amount of sun-checking and lost much of its design and detail in the shoulder area. The neoprene sidewall retained its new tire appearance without noticeable sun-checking or radical cracking. Both tires were retreaded in identical molds. The natural rubber tire is now out of service because of failure, but the neoprene tire has been retreaded for the second time and is still in service.

Pennsylvania Rubber Co., Jeannette, Pa., has promoted Edwin V. Duffy and Opha Lee Rogers to assistant sales managers, according to R. B. Cave, vice president in charge of sales, who also announced R. J. Scott's advancement to service manager. Before the promotions, Mr. Duffy was the Pennsylvania service manager, and Mr. Rogers was on the sales force of the Pittsburgh branch zone. Mr. Duffy, a native of Fairmont, W. Va., and a graduate of West Virginia University, served in the quartermaster corps as a captain during the war. Mr. Scott was previously a tires-batteries-accessories sales supervisor in the Pittsburgh division of the Atlantic Refining Co., and prior to that had been with the Goodyear Tire & Rubber Co. A native of Clarksburg, W. Va., Mr. Scott was graduated from West Virginia University in 1937.

Moldex Rubber & Plastics Corp., 1 E. 57th St., New York 22, N. Y., will operate its own rubber factory at 430 E. Alleghany Ave., Philadelphia 34, Pa., commencing September 1. The plant is equipped with a battery of mills, presses, extruders, and vulcanizers. Moldex will produce parts for industry, including molded and extruded rubber and synthetic rubber, chemically blown sponge rubber — slabs and sheets, hard rubber sheets and fabricated parts, pure gum and neoprene tubing, molded phenolic parts, soling materials, lathe cut and punched gaskets and washers. President of the company is Louis K. Braunston; vice president is Arthur A. Mayers.

Sun Oil Co., 1608 Walnut St., Philadelphia 3, Pa., has designated Los Angeles Oil & Grease Co., 1333 Willow St., Los Angeles, Calif., through its owner, O. S. Miller, West Coast marketer for rubber processing aids developed by Sun. Circo Light Process Oil and Circosol-sXH are among the Sun products now available in both tank car and drum quantities.

Manhattan Announcements

Manhattan Rubber Mfg. Division, Raybestos-Manhattan, Inc., Passaic, N. J., has received second award for outstanding excellence of its business magazine advertising during 1946 and 1947 in the recent National Advertising Agency Network competition. The advertising was created and placed through Roland G. E. Ullman Organization, Philadelphia. This award is the fourteenth received by Manhattan in the fields of advertising, merchandising, and public relations.

Manhattan Rubber has announced a new light weight hose with rayon strength members and Home-Flex construction. The hose, designated as Roy-Man, is being used successfully for bench work with small air-powered tools where ordinary air hose is too heavy and cumbersome. Because of its ease of handling and flexibility, the hose is also said to be ideal for use in industries requiring air for blowing or cleaning in small areas, such as the molded products and textile industries. Use of rayon makes possible the manufacture of an extremely light-weight hose having great strength and flexibility. Ray-Man hose is also available in an oil-proof type made with oil resistant rubbers. Both types are made in sizes ranging from ¼ to ½ inch.

Manhattan is manufacturing the largest brake lining ever made for use in Europe on the hoists of rehabilitated mines destroyed during the war. In order to accommodate the huge blocks, an outrigging extension was designed and constructed for the boring mill table used in the finishing operation. A single piece of the brake lining measures 30 inches long, 24 inches wide, and 5 inches thick. The weight of a single block is almost 300 pounds. The enormity of the installation is indicated by the hoist brake drums being about 22 feet in diameter. In the area where these blocks will be used, mine shafts usually burrow deeper as the mines grow older, necessitating the use of larger and more powerful equipment on the mine hoists.

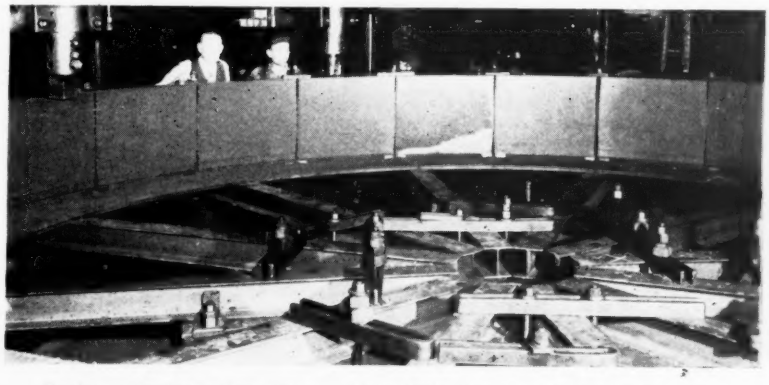
Koppers Co., Inc., Pittsburgh 19, Pa., has absorbed as integral parts of its organization two wholly owned subsidiaries, Pennsylvania Coal Products Co., Petrona, Pa., and Wailes Dove-Hermiston Corp., Westfield, N. J. The former company is now the Pennsylvania Coal Products department of Koppers' chemical division, under the direction of Dan M. Rugg, vice president and general manager of the division. C. F. Hesford, Jr., president of the Pennsylvania company, has been made manager of the coal products department; while sales of the department will be integrated with those of the chemical division under the direction of Sales Manager T. C. Keeling. R. C. Whitman, sales manager of Pennsylvania Coal Products Co, has been named eastern sales manager of the chemical division, with headquarters in New York

Wailes Dove-Hermiston Corp. is now operating as a department of Koppers' tar products division, under the supervision of J. N. Forker, vice president and general manager of that division. The three plants, at Westfield, East St. Louis, Ill., and Houston, Tex., become Wailes Dove-Hermiston plants Nos. 1, 2, and 3, respectively, of the tar products division. Linden Stuart, president of the Wailes corporation, has been appointed manager of the Wailes department.

Koppers plans expansions at the Petrolia and three Wailes plants.

Charles F. Hosford, Jr., president of Pennsylvania Coal Products Co., Petrolia, Pa., until its recent consolidation with Koppers chemical division, has been appointed a vice president in the division. Mr. Hosford will also continue active relation with the Petrolia plant as manager of the company's Pennsylvania Coal Products department.

Rubber Fabrics Co., 257-65 Fourth Ave., New York 10, N. Y., has added to its staff as representatives Michael H. Porter and Elmer T. Frasch. The former will cover New York and the Metropolitan Area; while the latter will cover Philadelphia, Baltimore, and Washington, from headquarters at 4111 Rosemont Ave., Drexel Hill, Pa. Both men have had long experience in the coated fabrics field and will handle all products of the company, including artificial leather, suedines, plastic films and fabrics for rainwear, jackets, sporting goods, luggage, automobiles, etc. Ben Aster, the company further announced, continues in charge of the luggage fabrics division and reports that the firm's new luggage will soon be ready for the trade.



Raybestos-Manhattan Installation to Make Brake Lining for 22-Foot Brake Drums

Takes over the Borger, but Gives up the Los Angeles Synthetic Rubber Plant

United States Rubber Co., Rockefeller Center, New York 20, N. Y., will undertake operation of the 45,000-ton synthetic rubber plant at Borger, Tex., and will relinquish operation of the synthetic rubber plant at Los Angeles, Calif., J. P. Coe, vice president and general manager of the Naugatuck Chemical and Synthetic Rubber divisions, announced last month.

Production of synthetic rubber latex will be continued at the Naugatuck, Conn., plant, which will also continue to make a super-processing GR-S, especially developed for wire insulation, the only GR-S, especially developed for wire insulation, the only GR-S to command a price premium in the industry.

Production of black masterbatch GR-S, chiefly for tires, will be continued at the Institute, W. Va., plant although, in line with the government's policy of curtailing synthetic rubber production, operations at Institute will be gradually reduced.

Production of GR-S by U. S. Rubber, which reached a high of 161,945 tons in 1944, will be on the basis of about 60,000 tons a year by the end of 1947.

The Borger plant, built and operated for the government by The B. F. Goodrich Co., is in the panhandle of Texas adjacent to a butadiene plant operated by Phillips Petroleum Co., which makes butadiene from butane extracted from natural gas. This area contains the world's largest natural gas field and is the center of production of channel black required in great quantity by the rubber industry.

Management and supervision personnel for the Borger operation will be drawn from the synthetic rubber plants now operated by U. S. Rubber at Los Angeles and Institute.

As more natural rubber has become available in this country, GR-S consumption has been gradually reduced. A total of 600,000 tons of GR-S was consumed in 1945 and 632,000 tons in 1946. But consumption of GR-S in 1947 will probably not exceed 400,000 tons.

Building permit has been issued for construction of a corrugated metal warehouse building at 5675 Anaheim-Telegraph Rd., East Los Angeles, Calif., for U. S. Rubber. The structure will contain 4,100 square feet of floor space, cost $9,000.

Promotions among Personnel

Three executive promotions in the company's tire division were announced July 14 by J. W. McGovern, vice president and general manager of the division.

Walter D. Baldwin was appointed director of manufacturers sales for the company's tire division. With offices in Detroit, he will handle the sale of tires to automotive manufacturers as original equipment on new vehicles.

J. Chester Ray succeeds Mr. Baldwin as sales manager of the U. S. Tires division; while Harry M. Ramsay succeeds Mr. Ray as sales manager of the Fisk Tire division. Mr. Ray and Mr. Ramsay will maintain their headquarters at the company's general offices in New York.

Mr. Baldwin has been associated with the automotive industry for many years. During the past two years he has been sales manager of the U. S. Tires division. He joined the company as a salesman in the Spokane, Wash., branch and has had varied sales experience, including positions as district manager at Salt Lake City and Portland, Oreg., assistant sales manager and sales manager of the Gillette Tires division, and merchandising manager of the U. S. Tires division. He is a graduate of the University of California.

Mr. Ray, Fisk sales manager since 1941, started with U. S. Rubber as a stockroom boy in the Pittsburgh branch in 1908. Following a number of positions in the rubber sundries and footwear divisions he became Pittsburgh branch manager in 1922. Subsequently he served as manager of passenger-car and truck tire sales in Detroit, Central division manager at Chicago, manager of branch tire sales in the general offices, and assistant general manager, U. S. Tires sales. He is a veteran of World War I and a member and past president of the New York Sales Managers' Club.

Mr. Ramsay, sales manager of the company's tractor and implement tire division at Detroit since 1944, has been in the tire business since 1924. For three years he was with the Fisk company before joining U. S. Rubber in 1935 as oil company representative. He later became assistant district manager at Baltimore, district manager at Newark, Baltimore, and Chicago, division manager in charge of fuel cell production at the Detroit plant, and assistant sales manager of the Fisk division. He attended Massachusetts Institute of Technology and was graduated from Harvard University in 1922. He is a member of the Society of Automotive Engineers and the Farm Equipment Institute.

John H. Murphy, since 1944 general superintendent of the general products division at the Providence, R. I., plant of U. S. Rubber, has been appointed assistant factory manager there to fill the vacancy caused by the elevation of Sherman I. Strickhouser to factory manager last February. Mr. Murphy has been affiliated with the company since 1919. In 1928 he was made superintendent of sundries and specialties. Beginning in 1941 and continuing until 1944 he was general superintendent of the company's wartime small arms ammunition project at the government-owned plant in Des Moines, Iowa. Mr. Murphy attended Dartmouth College.

The Fisk Tire division recently announced the following appointments.

F. G. Sargeant, now district manager in Chicago, succeeds W. L. Barbon, who resigned to open his own business as a Fisk distributer in the Maryland eastern shore area and A. A. Beguhn is Mr. Sargeant's successor as district manager at Minneapolis.

C. J. Morgan was made special divisional manager with headquarters at the Fisk general offices in New York. He will work with all district managers.

J. J. Davison succeeds Mr. Morgan as New York district manager.

Mr. Sargeant has been in the tire business since 1925, serving for two years as a Fisk distributer in Detroit and the remainder of the time in various retail, commercial, and wholesale capacities. His positions with Fisk have included assignments in Green Bay, Wis., South Bend, Ind., Chicago, and recently in Minneapolis, as district manager for two years.

Mr. Beguhn, in the tire business for 22 years, joined the company in 1940. He held sales positions in Des Moines, Omaha, and Kansas City, supervised ballistics work at the company's ordnance plant in Des Moines and was a special sales representative in the Kansas City and Minneapolis branches since the war.

Mr. Morgan, who has held tire company positions since 1926, has been with Fisk since 1938. After headquartering at Chicopee Falls, Mass., and Cleveland, he became manager of the southern division in 1940 and for the past six years has been Fisk district manager in New York.

Mr. Davison started with the company 15 years ago as a salesman at Kansas City. He was branch manager at Omaha from 1936 to 1940, held a special assignment in the company's petroleum division and has since served as district manager at Chicago, Portland and Los Angeles.

H. E. Humphreys, vice president and chairman of the finance committee of U. S. Rubber, and L. C. Boos, president of U. S. Rubber Export Co., Ltd., sailed from New York on the *Queen Elizabeth* July 2 for a two-month business tour. They will inspect the export company's operations in England, France, Belgium, Denmark, and Sweden.

Two scientists of U. S. Rubber's general laboratories, Passaic, N. J., are among 12 Americans invited to address the Faraday Society in England, it was announced by S. M. Cadwell, company director of research and technical development. The men, Frank R. Mayo and Cheves T. Walling, will present three papers on basic synthetic rubber research before approximately 1,000 European scientists at the Society's meeting on September 23 to 25 in Oxford.

The purpose of the meeting, the first in the field since before the war, is to exchange information on free-radical chemistry, a fast-growing branch of basic science underlying promising developments in plastics, rubber, and other phases of organic chemistry, Dr. Cadwell said. A serious European paper shortage has long delayed the publication and exchange of information on discoveries made there during and since the war. The meeting is expected to bring leading laboratories up to date on scientific progress and thus speed future work. French, Russian, Belgian, and Dutch scientists will attend.

Drs. Mayo and Walling will sail from New York on September 11. In addition to attending the meeting, they will spend three or four weeks visiting laboratories in England, Scotland, and on the Continent, to compare notes with other workers.

Frank R. Mayo (l.) and Cheves T. Walling (r.) of U. S. Rubber, Who Will Speak before the Faraday Society in England.

New Products Announced

A new line of portable electrical cords, featuring a heavy-duty neoprene jacket to provide increased protection against abrasion and damage, is being introduced by

BUTAPRENE NAA WITHSTANDS AMAZING HEAT TEST... RESISTS 300°F FOR 70 HOURS

Is HEAT RESISTANCE YOUR PROBLEM? Then Butaprene NAA is your answer. Look at the results of this amazing heat test. Aged in air tubes for 70 hours at 300 degrees F., Butaprene NAA actually showed an *increase* in tensile, practically *no* durometer change—properties of inestimable value in gaskets, diaphragms and other rubber parts where disintegration due to high heat is a serious factor.

Extreme heat resistance is just another PLUS feature of Butaprene NAA. For the complete story on this newest and most versatile of the Butaprene N family, write Xylos Rubber Company, Distributors, Akron 1, Ohio.

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Listen to the Voice of Firestone every Monday evening over NBC

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FORMULA

R-9602-B

Butaprene NAA	100.0
Medium Thermal Black	115.0
Antioxidant	5.0
Zinc Oxide	5.0
Tetrone A	1.25
Santocure	1.25

HEAT TEST

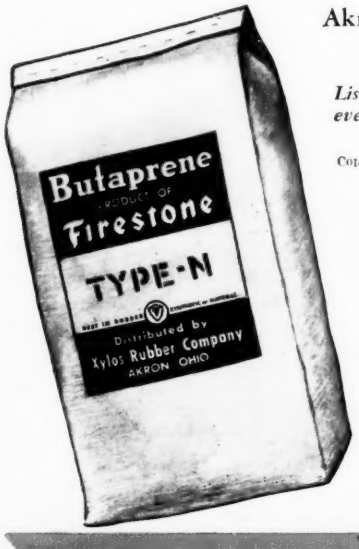
Slabs cured 20 minutes at 312° F.

Original Properties

Tensile	1390
Elongation	535
Durometer	66

Aged in Air Tubes 70 hours at 300° F.

Tensile	1450
Elongation	225
Durometer	68
Flexibility	Very good



BUTAPRENE N by Firestone

AMERICA'S MOST VERSATILE ELASTOMER

the company's wire and cable department. The thickness of the new jacket has been increased 30-60%, without increasing the overall diameter of the cord. This construction is made possible by use of the company's Laytex insulation on the individual conductors within the cord. Laytex is applied by a dipping process which produces a thinner insulation with superior physical and electrical properties. The new cables, distributed under the name of U. S. Royal Master Cords, will be made in sizes 10-18, with two, three, or four conductors, and both with and without steel wire reinforcement. The cords are designed to withstand extreme flexing, constant movement, and surface abuse and are intended for use on tools, lamps, refrigerators, heaters, sound equipment, cash registers, and other electrical apparatus.

A new dish towel, said to wipe dishes faster and dryer, was recently introduced to New York housewives. The unusual thing about this towel is that it contains 20% asbestos, a material long noted for its fire-resistance and recently discovered to have excellent water absorption and polishing properties. Known as Carosel, the new towel is produced by U. S. Rubber's textile division and is made in a range of six colors: red, green, yellow, rose, blue, and burgundy. Asbestos combined with 80% cotton produces a fabric resembling linen in appearance. When dyed, the cotton absorbs color, but the asbestos remains white, resulting in a mottled fabric. Although the 20% asbestos content is sufficient to provide maximum polishing and wiping efficiency, it is not enough to make the towel fireproof.

Blaw-Knox Construction Co., chemical plants division, Pittsburgh, Pa., has signed Pierre H. Courouleau as consulting engineer specializing in activated carbon installations for the recovery of volatile solvent vapors. Prior to joining Blaw-Knox, Mr. Courouleau was director of engineering for Carbonisations & Charbons Actifs, Paris, France, and supervised the design and erection of solvent recovery plants in England, France, Spain, Italy, and North Africa. The entrance of the chemical plants division into the field of solvent recovery by means of activated carbon constitutes another phase of the Blaw-Knox program to extend a comprehensive engineering and construction service to the process industries. R. E. Benson will direct this new activity.

American Viscose Corp., 350 Fifth Ave., New York, N. Y., in conjunction with the rubber companies, has developed a new use for rayon in the form of fan belts for automobiles, refrigerators, deep freeze units, and air conditioners. Accelerated tests conducted by one manufacturer indicate fan belts made with continuous filament, high-tenacity rayon cord last 50% longer than other belts in some types of service. In practically every instance rayon cord belts produced an economic saving. Fan belt manufacturers report rayon cord belts to have three principal advantages: they have practically no stretch; flex strength is increased because the rayon cords, being smaller, build up less heat and retain strength when heated; and rayon cords have greater strength in small diameters, making possible a more compact, thinner neutral belt section of maximum pulling power and minimum bending stresses. The rayon cord used is similar to that employed in tires and has the extra strength and resistance needed in high-speed V-belts and cog-belts.

Binney & Smith Co., manufacturer, exporter, and importer of blacks, colors, clays, chemicals, and talc, 41 E. 42nd St., New York 17, N. Y., recently held a two day sales and technical session in New York, attended by the local staff; A. W. Bryant, resident manager in Boston, Mass.; and R. H. Marston, Jr., and L. W. Reeves, of the firm's Akron, O., office. Sales and technical trends were discussed, and future policies outlined. Iron oxides, stearic acid, mineral rubber, bone black, and various base and water dispersions were considered besides carbon black. Despite a small easing for some items the consensus was that business for the third quarter would be good and that production of all products must be kept at peak to fill the demand. Discussions were conducted by A. F. Kitchel, Binney & Smith president, and J. M. Hamilton, assistant to the president.

Financial World, 80 Trinity Place, New York 6, N. Y., has cited for excellence in its Seventh Annual Report Survey the 1946 annual financial reports to stockholders of the following eight companies: Armstrong Rubber Co., Dayton Rubber Co., General Tire & Rubber Co., Goodyear Tire & Rubber Co., Norwalk Tire & Rubber Co., Pharis Tire & Rubber Co., Seiberling Rubber Co., and Thermoid Co. In the final judging to be completed in mid-September one of these companies will be selected as having the best 1946 annual report of the rubber and tire industry and then will be awarded the bronze "Oscar of Industry" trophy at the *Financial World* annual report awards banquet at the Hotel Pennsylvania, New York, on October 10. Last year Dayton Rubber was the winner.

Hercules Powder Co., Wilmington, Del., recently elected Reginald Rockwell to the board. Mr. Rockwell, general manager of the paper makers chemical department, has been with the company since 1922, when he joined the naval stores plant at Brunswick, Ga.

Brake Lining Manufacturers' Association, Inc., 370 Lexington Ave., New York, N. Y., at its recent annual meeting in Absecon, N. J., elected the following officers for the year starting July 1, 1947: president, Vincent A. Spina, treasurer of Scandinavia Belting Co., Newark, N.J.; vice president, Wm. A. Blume, president of American Brakeblok Division, American Brake Shoe Co., Detroit, Mich.; treasurer, Wm. H. Dunn, comptroller of Raybestos-Manhattan, Inc., Passiac, N. J.; secretary, Miss Harriet G. Duschek. Elected directors in addition to Mr. Spina and Mr. Blume were: Frederick E. Schluter, president of Thermoid Co., Trenton, N. J.; Leslie M. Cassidy, vice president of sales, Johns-Manville Corp., New York; Donald H. Spicer, president of World Bestos Corp., New Castle, Ind; Robert E. Davis, executive officer of Raybestos-Manhattan, Bridgeport, Conn.; Thomas L. Gatke, president of Gatke Corp., Chicago, Ill.

OHIO

General Tire Advances Several

General Tire & Rubber Co., Akron, has appointed J. P. Stanley new manager of the Chicago branch sales organization. He was formerly in charge of the company's central division truck tire sales and sales personnel training. A sales executive with insurance and tire companies for 26 years, Mr. Stanley joined the General organization in 1941.

The Chicago branch is a part of the Midwest division, headed by Ralph Countryman, and in his assignment Mr. Stanley succeeds Frank H. Sibley, recently named to direct General's newly created St. Louis branch. Mr. Countryman, in announcing Mr. Stanley's promotion, said that the branch headquarters will remain at 2247 Cottage Grove Avenue, where Mr. Countryman also has his offices.

R. G. Hanson, formerly with the Midwest division office in Chicago, has been named branch manager of the Minneapolis branch.

Management of the Kraft service and accessory sales of General Tire has been assigned to Stephen S. Berry. In addition to his new assignment, Mr. Berry, who previously headed battery sales, continues in that capacity and also holds full supervision over the Kraft system of tire repairing. Twenty years ago he started in the tire business with the Converse Rubber Co. Since then he has served in executive capacities with other battery and tire companies. He came to Akron 14 years ago and joined General in 1936.

At the same time Vice President L. A. McQueen disclosed Henry A. Haas's promotion to assistant manager of Mr. Berry's department. Mr. Haas succeeds Collins O. Buckmaster, who died May 27. Mr. Haas has been with General since October, 1938, in accessory and repair material sales. He received his B.S. degree in marketing and advertising from Akron University in 1938. A second lieutenant in Army Ordnance during World War II, he served in the Pacific area in tire repair.

Changes at Firestone

Firestone Tire & Rubber Co., Akron, has named A. D. Miller general manager of its synthetic rubber plants. Formerly technical division manager for the plants, Mr. Miller succeeds K. K. Wyatt, who came to Firestone with the start of the synthetic rubber program during the early days of the late war and who is now returning to his previous work. Mr. Miller joined the company 13 years ago, working nights in the physical testing laboratory while attending Case School of Applied Science in Cleveland. Upon completion of his chemical engineering studies there Mr. Miller began work in Firestone's general laboratory. When the synthetic rubber plants were started, he became technical manager and served on some of the original technical committees setting up the national synthetic rubber program, first under Mellon Institute and then under Rubber Reserve Co. Mr. Miller now represents the operators of copolymer plants on the committee which sets up specifications for all plants in the country.

Howard Cable, production manager at Firestone's synthetic rubber plant, has

To Make Better Tires...Faster

SUN RUBBER-PROCESSING AIDS...

Improve Quality, Speed up Processing of Natural Rubber, GR-S, Neoprene, and Reclaims

With natural rubber becoming more and more available to blend with synthetics and reclaims, the problem of picking the right processing aids for every combination becomes especially important.

Sun now offers the manufacturer a choice of four "Job Proved" processing aids:

CIRCO LIGHT PROCESS OIL—For Neoprene tires and tubes and for rubber components.

CIRCOSOL-2XH—A specially developed elasticator for the GR-S component of tires. A plasticizer and softener for natural rubber.

CIRCOMAR-5AA—A free-flowing softening material of the asphalt-flux type, easy to handle at ordinary room temperatures and recommended for natural rubber, synthetic or blends.

SUNDEX-53—A processing aid in the low-cost bracket. Highly compatible with natural and synthetic rubbers.

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been transferred to the company's factory in Bombay, India.

The most intensive tire testing program ever attempted is now being carried on to provide motorists with new postwar tires that are safer and that assure more miles of service per dollar, according to L. R. Jackson, Firestone executive vice president, who recently reviewed his company's 1946 test program. More than 90,000,000 tire miles were run under test by Firestone last year, equivalent in mileage to rolling a tire around the equator for 200 years at the rate of 50 miles per hour, Mr. Jackson revealed. One test fleet of 140 truck and trailer units accumulated 65,000,000 tire miles during 1946; while a smaller fleet of 11 trucks and 17 passenger cars ran 10,000,000 tire miles over Texas highways. Hundreds of tires were run on indoor test drums at high speeds to determine whether tread designs are noisy or quiet, and whether new tire constructions are subject to tread or ply separation. A hydraulic plunger rams inflated tires to test their resistance to the shock of severe bumps; while in another test one side of the inflated tire is squashed flat to test the strength of the bead, sidewall, and cord body. During 1946, daily records on the performance of 4,500 tires were kept. Records on excavator tires covered 5,000,000 test miles in coal mining operations; 3,000,000 miles of bus operations; 750,000 miles of three-mile-an-hour farm tractor operations; and more than 6,500,000 miles of laboratory drum testing.

Goodrich Executives Promoted

Robert Price is to be the manager of the development department for the plastics division of The B. F. Goodrich Co., Akron, O., and will have charge of all technical work at the new plant at Marietta, it is announced by Bert S. Taylor, factory manager. The plant, now in the final phases of construction and outfitting, will begin operations in a few weeks.

Mr. Price has been with the company since 1938, after receiving his bachelor's degree in chemical engineering and his master's degree in organic chemistry from Bucknell University. Starting in the laboratories, he has held a wide variety of technical posts, including general foreman in the reclaim rubber department and during the war in the rubberized fabrics department. For the last two years he has been manager of technical service and development in the plastics division at the company's Akron plant.

Edwin J. Lewis has been named manager of petroleum company sales for the replacement tire sales division succeeding Howard F. Miller, assigned other duties. With Goodrich 18 years, Mr. Lewis has held a number of advertising, sales promotion, and sales posts, and for the last year has been assistant to the manager of passenger-car tire sales. He is a graduate of the University of Illinois.

Two new appointments have been announced by S. W. Caywood, president of International B. F. Goodrich Co. R. M. Kellum, formerly representative in New York, N. Y., will represent the company in Puerto Rico, Haiti, the Dominican Republic, and Virgin Islands and will be succeeded by Carl S. Weber in the Manhattan Offices. Mr. Kellum, with the organization since 1935, had been New York representative for the last four years. Mr. Weber has been a sales correspondent since his return from service with the Armed Forces.

Later in the month the resignation, because of health, of Mr. Caywood was announced by John L. Collyer, president of The B. F. Goodrich Co. Mr. Caywood recently completed 30 years with the company, which he had joined following his graduation from Baker and Columbia universities. He was an officer in the American Expeditionary Forces in World War I.

His company activities have been entirely in the export field, and he has been a world traveler for many years, recently returning from a tour of Latin American countries.

After nine years as assistant sales manager of the company's foreign department, Mr. Caywood became vice president and director of International Goodrich. In 1941 he was named general manager of the International division and vice president and director of eight associated and subsidiary companies in various parts of the world. He was elected president of International Goodrich in 1946.

Named successor to Mr. Caywood was Willard C. Gulick, formerly general sales manager of the export division. Mr. Gulick joined Goodrich in 1926 after graduating from Colgate College. His first position with the rubber company was as a salesman in the Boston district. Promotions followed, and for 12 years prior to the outbreak of the late war Mr. Gulick represented Goodrich overseas. He served as general manager in the Hawaiian Islands and later in the Philippine Islands and was general manager of Goodrich interests in Sweden when the war began. Mr. Gulick returned to the United States in 1940.

Construction of the new plant to make wood cores for rubber heels has been started by Goodrich in Clarksville, Tenn., where its heel and sole manufacturing facilities are located. Production of cores will start in the plant this fall. The cores will be used in several lines of heels produced by the company, where they have been featured for several years, and also will be sold to other manufacturers utilizing wood cores in heels.

Reorganizes Purchasing Department; Other Changes

Reorganization of the purchasing department of The Goodyear Tire & Rubber Co., Akron, O., with the creation of three division manager posts, was announced by E. H. Brooks, company director of purchases. Rollin Chittenden and Marc W. Laibe have been assigned to two of these division managerships, and L. A. Murphy, purchasing agent at Goodyear Aircraft Corp., in Akron for six years, is the third division manager. H. A. Delaney, of the tire company's purchasing department staff, has been transferred to Aircraft as purchasing agent.

The reorganization follows the death of George E. Price, Jr., May 30, after 25 years as purchasing agent in the department.

Mr. Chittenden joined Goodyear in 1920 in its factory efficiency department; a year later he was tranferred to production control and, in 1922, was assigned to the purchasing department. Graduate of the University of Denver, he saw service in World War I and previous to that had been with Swift & Co. in Chicago for a year.

Mr. Laibe has been with Goodyear since 1925, following graduation from Ohio State University. In July, 1942, he was assigned to Goodyear Aircraft as assistant purchasing agent, returning to the tire company's purchasing department in October 1945. Then on March 1, 1947, he was made assistant purchasing agent.

Following graduation from Ohio State University, Mr. Murphy began his service with Goodyear in July, 1925, in a factory training course. Later he joined the purchasing organization and in April, 1941, was made purchasing agent for the Aircraft corporation.

Mr. Delaney came to Goodyear in January, 1917, in the accounting department, where he spent five years. He was associated with the Akron purchasing department until 1929, when he was sent to the Gadsden, Ala., plant as purchasing agent for a year and a half. Following came an assignment with Goodyear's Argentina factory as purchasing agent until 1942, when he was returned to the Akron department.

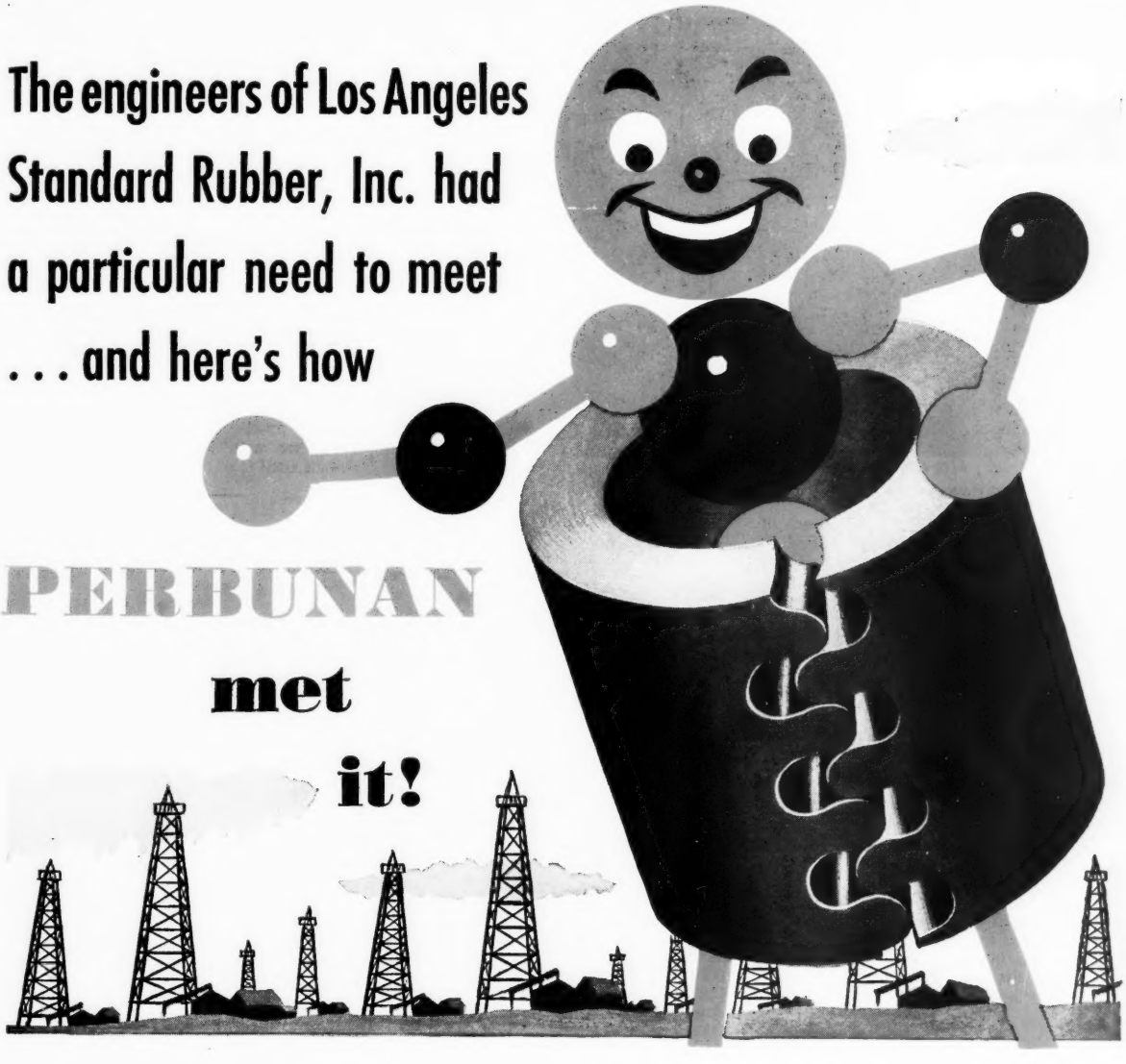
J. H. Conrad, tobacco packaging specialist for the Pliofilm department, has been named manager of Pliofilm converter sales. Mr. Conrad, reporting to A. F. Landefeld, manager of the Pliofilm sales department, succeeds J. C. E. Williams, now manager of the Pliofilm department of The Goodyear Tire & Rubber Export Co., a subsidiary which operates in foreign countries. Mr. Conrad has been with the Goodyear organization since May, 1929, while Mr. Williams joined in June, 1946, when he returned from military service. Both men will make their headquarters in Akron.

Goodyear recently awarded service pins to the following veteran employes: 25 years, L. R. Rufe, district manager in Hartford, Conn., W. A. Forrest, store supervisor in Richmond, Va., Wm. T. Goodwyn, district operating manager in Salt Lake City, Utah, T. R. O'Brien, manager of the New York crude rubber office; 30 years, K. C. Zonsius, manager of auto tire sales, George K. Hinshaw, manager of foreign operations, Harry Hart, manager of mechanical goods operating, and Fred W. Climer, vice president in charge of industrial relations.

Installation of the world's longest production line for the fabrication and assembly of houses has been completed at the new Wingfoot Homes, Inc., plant at Washington Park, Ill., it was recently announced by J. C. Thomas, company vice president. Over a quarter of a mile long, the production line is geared to turn out a finished house every hour. With full production of 24 to 30 houses a day, the line will employ approximately 1,100 workers on a three-shift basis. The company plant, a Goodyear subsidiary, was a former wartime valve factory that has been reconverted. Limited production was started a few months ago and has reached 10 houses a day, prior to complete tooling.

The line traverses three separate buildings where various preparatory, sub-assembly, final assembly, erection, and painting operations are conducted. Raw materials entering the mill room at the start of the construction cycle are planned to leave the line 24 hours later in the form of a finished house. More than 52 homes are in various stages of erection at one time. Modern automotive mass-production methods are copied in the pro-

The engineers of Los Angeles Standard Rubber, Inc. had a particular need to meet . . . and here's how



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World's Longest Home Production Line at Wingfoot Homes, Inc., Plant at Washington Park, Ill.

duction line, developed after two years of pilot operations in the original Wingfoot factory at Litchfield Park, Ariz. There is no back-tracking of materials, and partial or sub-assembly sections move forward on dollies along the production line rails. Overhead cranes are utilized for the lifting of floor units and side assemblies, and for setting roofs in place. Heavy fork trucks move the finished houses, which weigh more than three tons, from the end of the line to flat cars and trucks.

The Wingfoot Home emerges from the production line complete with walls, roofs, floors, and windows, ready to be set on a foundation. Bathroom and kitchen fixtures have been installed, and beds, bureaus, closets, mirrors, and cabinets have been built in. Telescoped wings provide for single or twin bedrooms which convert the units into a T-shaped house that measures 26 feet by 15 feet. The house sells for $2,650 at the factory and can be trucked direct to the building site. The initial production at the plant has gone to veterans' emergency housing projects.

NEW ENGLAND

"The Whitney Blake Story"

The history and development of the Whitney Blake Co. was the subject of a story in a recent issue of the *Royle Forum*, published by John Royle & Sons, Paterson 3, N. J. The story traces the growth of the Blake company from its establishment by T. W. Blake and F. S. Minnott in 1899 as the Goodyear Rubber Insulating Co. in New York. After producing flexible cord sets for the infant electrical appliance industry, the company added a line of telephone wires to its activities in 1903. As the telephone industry expanded, the company's facilities became inadequate and the first unit of the present plant was built at Hamden, Conn., in 1912. The company continued its growth and added to its lines of wires and cables. With the advent of the 1932 depression, the Goodyear factory in New York was closed, and all activities were moved to Hamden. After a reorganization in 1939, Frank Swayze and his associates took over control of Whitney Blake and began to rebuild and modernize the company and install a development and control laboratory. The company performed important services during the war and underwent further expansion. Out of the Whitney Blake laboratories have come the "Teleplate" continuous wire coating process, "Teleprene" neoprene-coated telephone wire, and "Plastite" insulated wire for radio use. John B. Cooke succeeded to the company presidency after the death of Mr. Swayze, and under his control the company's policy of scientific planning as a basis for all production is expected to bring continued prosperity and growth.

Erecting New Plant

A. G. Spalding & Bros., sporting goods manufacturer, New York, N. Y., broke ground on June 23 for a new plant, originally planned before the war, to cost about $2,000,000 and to provide about 300,000 square feet of floor space, covering approximately seven acres, to be erected beside its Willmansett, Mass., plant, which contains about 200,000 square feet of floor space on a plot of 32 acres. When the new factory is finished, the total plant layout, including the two factories and other smaller buildings, will cover about 13 acres, with the remaining space to be used for a 500-car parking lot, a baseball diamond, various outdoor recreational facilities for employes, and the famous Spalding driving range. Some of the features of the new factory include a large display room, a modern hospital, a 500-seat cafeteria, large quarters for the Spalding research laboratory, and an advanced photographic department for pictures revealing exactly what happens to sports equipment when in play.

It is expected that the new plant will be completed late in the Spring of 1948, when the nearby Chicopee factory and warehousing facilities will be vacated. The company started manufacturing in Chicopee Falls, Mass., in 1894 and moved to the present factory in Chicopee Center a decade later. The plant and the property at Willmansett were obtained 17 years ago. Also to be closed when the new construction is completed is the factory at Brattleboro, Vt., operating since 1938. The plant in Brooklyn, N. Y., however, opened in 1895, will continue to run.

According to *The Sporting Goods Dealer*, the Spalding concern got its start in Chicago, 71 years ago when the two Spalding brothers began business with a capital of $800. Company assets have passed the $15-million mark, and 1946 sales totaled almost $19½ million.

Farrel-Birmingham Co., Inc., Ansonia, Conn., in its current issue of its house organ, *Equipment News*, carries a story on the use of F-B equipment in the West Haven, Conn., plant of the Armstrong Rubber Co. The machines used include six No. 11 Banburys, nine 84-inch roll mills, one 8-inch strainer, two 8-inch tubers, one 6-inch tuber, and one 28 by 78-inch four-roll double coating calender. Detailed descriptions are given of the various processing operations employed, together with photographs of the equipment used.

MIDWEST

Rebuilding Styrene Plant

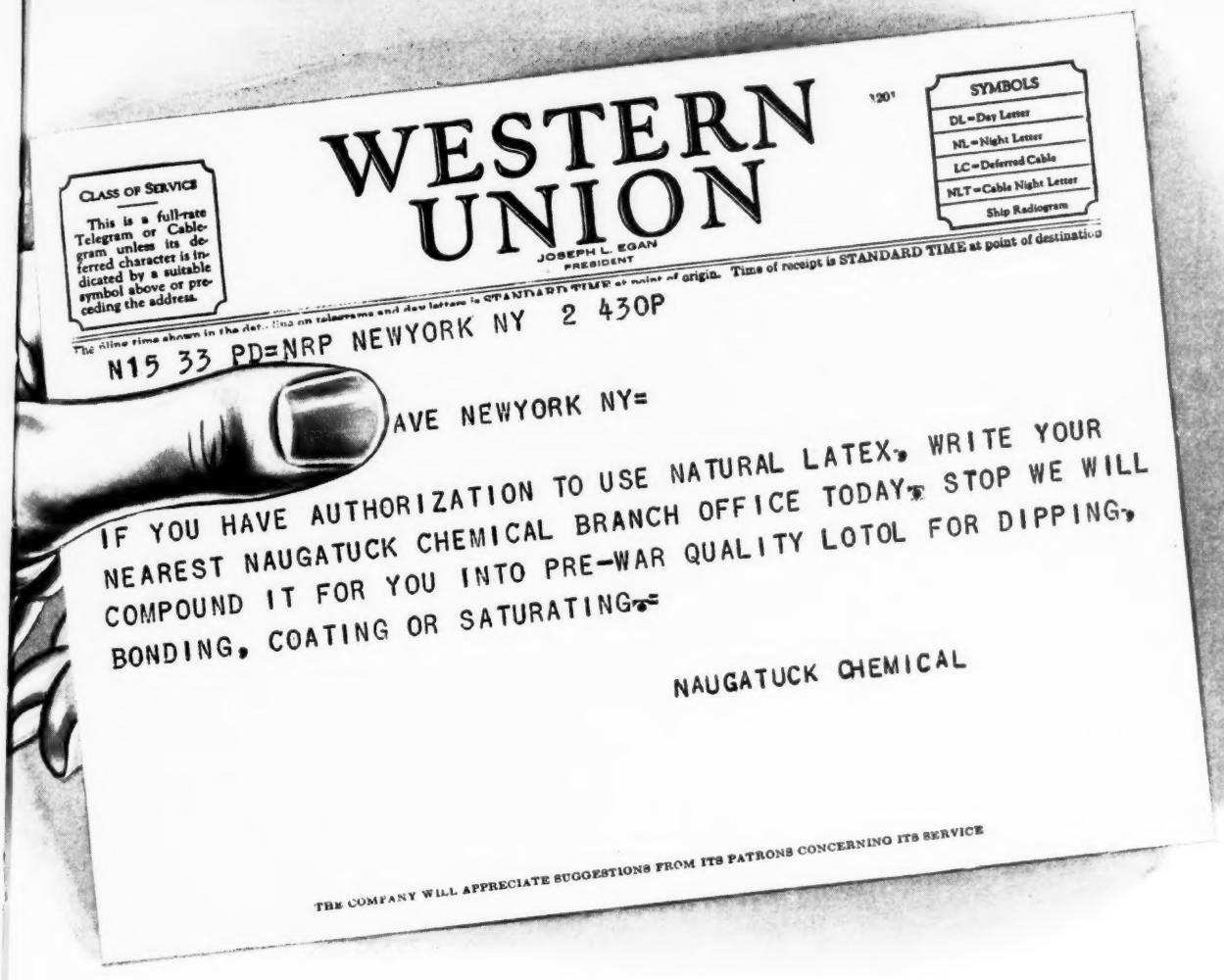
Monsanto Chemical Co., St. Louis Mo., has awarded contracts for the reconstruction of part of the plant destroyed in the Texas City, Tex., disaster of April 16. J. R. Mares, general manager of the company's Texas division, estimates that the building contract would amount to somewhat more than $1,000,000; while mechanical installations with process equipment would approximate $5,000,000. A minimum of 1,500 men will be employed on the job. The rebuilding of the remainder of the plant, however, will be started when this construction work and installation are substantially complete and the plant is again in operation.

Personnel Changes at Monsanto

A new position in industrial research was actuated by Monsanto on July 14 with the appointment of one of its foremost Everett, Mass., chemists as senior scientist to pursue pioneer work in new fields and techniques. Assistant Research Director Albert H. Bump, of the Merrimac Division, was named to the new post created for men of unusual achievements, and abilities to increase the scope of exploratory research. Mr. Bump is a native of Brockton, Mass., and a Harvard University graduate. A veteran of World War I, he studied at the Harvard Graduate School before entering the Everett plant in 1920. He became assistant research director in 1926.

The position of senior industrial scientist was conceived and instituted at Monsanto by Charles Allen Thomas, executive vice president of the company. In outlining the new position, Dr. Thomas explained that the United States has too long relied on the basic inventions of Europeans and that the nation must lead in original scientific discovery if it is to survive in an atomic age. The position of senior scientist was originated, he explained, to give outstanding scientists freedom for original research and to divorce their work from more limited industrial activity.

Chester L. Jones, Jr., has been made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sales manager of the company's protective coatings department, with headquarters at the Merrimac Division at Boston, Mass. A native of Kansas City, Mo., Mr. Jones is a graduate of Yale University, with a B.S. degree in chemistry (1936). He signed with the Resinox Corp. as a research chemist and in 1937 was transferred to the sales office in Boston. In 1939, with the acquisition of Resinox Corp. by Monsanto, Mr. Jones joined the plastics division at Springfield, Mass., in a research and sales development capacity. In 1944 he was appointed assistant manager of the product development department and a year later became manager.

Richard D. Dunlop, associate director of research at the company's plastic division at Springfield, Mass., has been named technical director in charge of research and development of the Texas Division, with headquarters at Texas City, effective September 1. Mr. Dunlop, who received a B. S. degree in chemical engineering from Washington University, in 1931 and an M. S. degree in 1933, joined Monsanto in 1927 as a laboratory analyst. In 1933 he became a chemist at the John F. Queeny plant at St. Louis and in 1938 became production superintendent of the subsidiary, Shawinigan Resins Corp. at Springfield. He was transferred to the plastics division in 1939 as assistant director of research and became associate director of research in 1944. From December, 1946, to March, 1947, he served as technical investigator for the United States Department of Commerce in occupied Germany, reporting on the German plastics industry. At present he is chairman of the Connecticut Valley Section of the American Chemical Society and a member of the Technical Association of Pulp Paper Industry, and Alpha Chi Sigma.

R. M. Hitchens has been made research director of the organic chemicals division. Dr. Hitchens, who served as associate director since 1944, succeeds Lucas P. Kyrides, who recently resigned. Concurrently it was announced that O. J. Weinkauff, assistant director, was promoted to associate director, and that F. B. Zienty and L. L. Fellinger, group leaders, were advanced to assistant directors.

Dr. Hitchens, who joined Monsanto in 1931, received a Ph.D. degree from the University of Michigan in that year. At Monsanto he has served as assistant chief analyst, research group leader, and assistant research director. He is a member of the American Chemical Society and has contributed a number of papers on electrochemistry and analytical chemistry to technical publications.

Dr. Weinkouff, who received a Ph.D. degree in organic chemistry from the University of Michigan in 1931, joined Monsanto in 1931 as a research chemist, was made a group leader in 1933 and assistant research director in 1941.

Dr. Zienty came to Monsanto in 1938 as a research chemist. Earlier that year he had received a Ph.D. degree from the University of Michigan. In 1940 he became a research group leader. He belongs to the A. C. S., Alpha Chi Sigma, the American Institute of Chemical Engineers, the American Pharmaceutical Association, and the Society of Chemistry and Industry

Dr. Fellinger received an Sc.D. degree in chemical engineering from Massachusetts Institute of Technology in 1941. Shortly thereafter he came to Monsanto as a research chemist and in 1944 became a pilot-plant group leader. He is a member of the A. C. S. and the A. I. C. E.

D. E. Davidson

H. L. Hoefman

Promotions at Link-Belt

Link-Belt Co. at a recent meeting of the board of directors elected Harold L. Hoefman vice president; effective July 1, he became vice president in charge of manufacturing, with headquarters at executive offices, 307 N. Michigan Ave., Chicago 1, Ill. Mr. Hoefman, general manager of the company's Pershing Rd. plant, Chicago since 1943, entered this plant in 1920 as a draftsman. He subsequently held various important positions as sales engineer at Chicago, Kansas City, and Dallas. He was made district sales manager at Indianapolis in 1932; was appointed manager of the Detroit office and warehouse in 1935; and from 1938 to 1943 was general manager at the company's plant in Atlanta, Ga.

David E. Davidson succeeds Mr. Hoefman at the Pershing Rd. plant. Mr. Davidson, who headed the engineering department at the plant since the beginning of the year, is a mechanical engineering graduate of Armour Institute of Technology and entered the employ of the company's Caldwell plant, Chicago, in 1924 in the shop. He subsequently served as a draftsman in various branches of the engineering department at both the Caldwell and Pershing Rd. plants; became sales manager at Atlanta in 1935; district sales engineer at Detroit in 1936; and from 1943 through 1946 was district sales manager at Indianapolis.

Ralph W. Rausch, assistant chief engineer at the Pershing Road Plant, in charge of estimate-engineering since 1933, has been appointed chief engineer, succeeds C. S. Huntington, who retired because of ill health. Mr. Rausch, a graduate of Valparaiso University (1909) and Purdue (1912) with a B. S. degree in civil engineering, entered Link-Belt employ in 1925 at the Caldwell plant, Chicago, as a belt conveyer specialist, after a broad engineering experience with a number of companies. He has been a member of the Pershing Road plant since 1927, successively as sales engineer, specialty engineer, and assistant chief engineer.

H. Walter Regensburger, since 1944 assistant to the vice president in charge of engineering, at executive offices, Chicago, has been made divisional engineer in charge of estimate-engineering at the Pershing Road plant. Mr. Regensburger, a graduate of Armour Institute of Technology (1925) with a degree of B.S. in mechanical engineering, joined Link-Belt in 1926 at the Caldwell plant after a year's engineering experience with two other companies. He has successively served in the estimate-engineering departments of both the Caldwell and Pershing Road plants, in merchandise sales at Pershing Road, and from 1936 to 1944 as chief engineer at the company's Atlanta plant.

Eugene P. Berg, assistant to the president since the recent death of E. L. Berry, vice president in charge of production, has been named general superintendent of the Pershing Road plant. Mr. Berg, a graduate of Purdue (1937) with the degree of B.S. in mechanical engineering, also M.B.A., University of Chicago (1945), began his Link-Belt career by working in the Pershing Road shop during vacations from 1929 to 1937. He has successively been supervisor of methods department at Pershing Road, general foreman of the structural steel shop, and from 1945 to 1947, works manager at the company's Philadelphia plant.

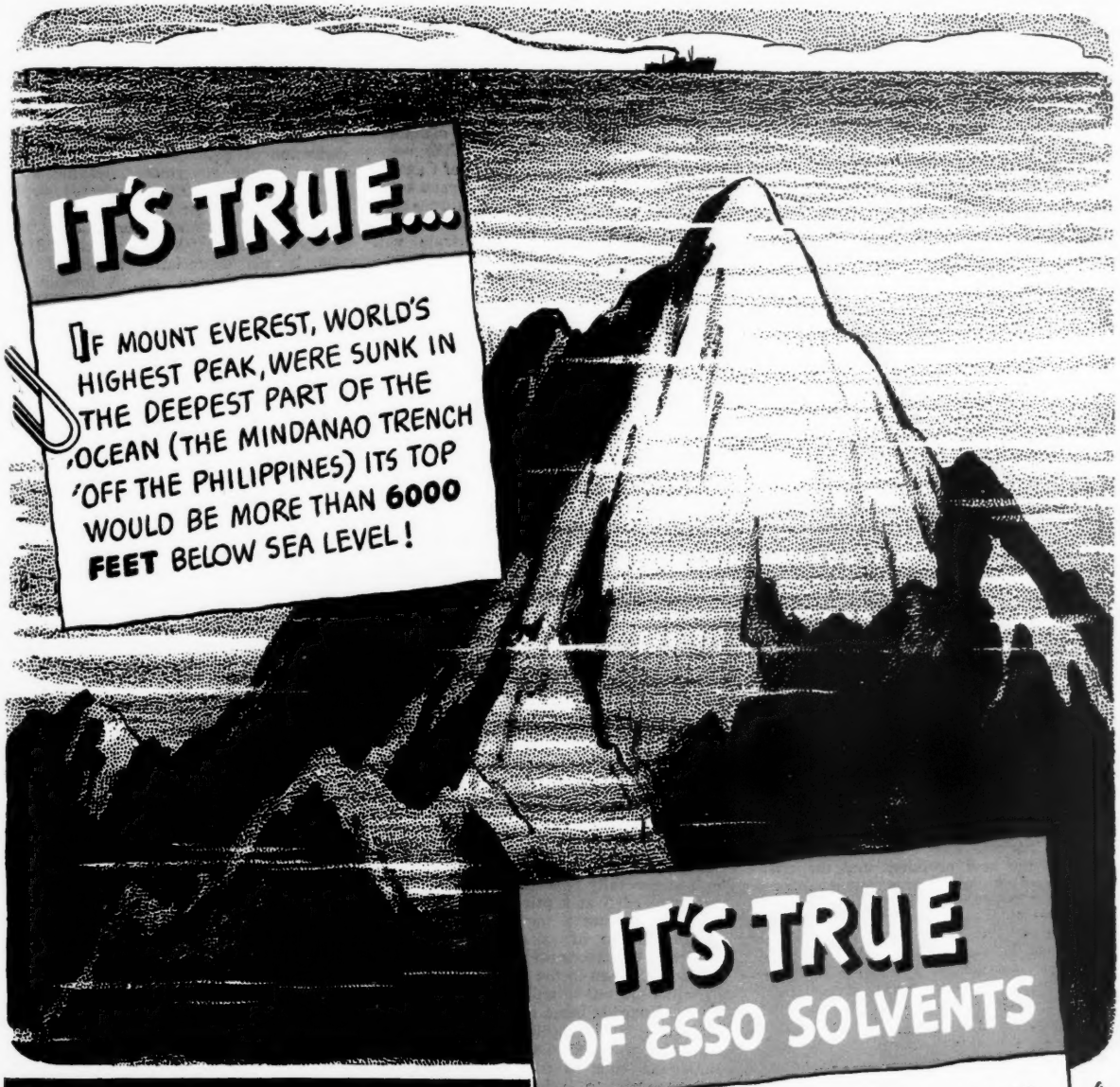
Joseph C. Spence, general superintendent at the Pershing Road plant since 1942, has been made assistant to Vice President Hoefman. Mr. Spence started with the company in 1924 in the machine shop of the Pershing Road plant, immediately after being graduated from Williamson Trade School. He has successively served in the rate setting department, as head of the time study department, then as operating superintendent and general superintendent.

Bjorksten Research Laboratories, 185 N. Wabash Ave., Chicago 1, Ill., has announced that James R. Darnell has joined the company in the capacity of assistant to the president. Mr. Darnell was educated at Carleton College, Northwestern University, and the University of Illinois, from which he was graduated in June, 1942. Subsequently Mr. Darnell was employed as a chemist by the Corn Products Refining Co. and the Pure Oil Co. He also taught chemistry at Trinity University in San Antonio, Tex.

CANADA

Firestone Tire & Rubber Co. of Canada, Ltd., through Divisional Manager H. J. Morrow, has announced price reductions for farm tractor tires ranging from $14 to $50. The most popular size of tractor tire, the 10-28, was reduced from $70.95 to $56.95; while tubes for these tires are now $12.05 instead of $14.15. In one or two of the largest tractor tire sizes, prices have been lowered by as much as $50, according to Mr. Morrow. These lower Canadian prices are now more or less in line with United States prices for corresponding tractor tires and tubes. Supplies of tractor and passenger-car tires in Canada are stated to be good.

Dominion Rubber Co., Ltd., Montreal, P. Q., recently received notification from the Quebec Assn. for the Prevention of Industrial Accidents that all six plants which it operates in Quebec had completed the month of June without a single lost-time accident. The six plants, which received special safety certificates are the Mechanical Goods Papineau Factory, Latex & Reclaim, Montreal Footwear Factory, Canadian Lastex, Ltd., all of Montreal, and the Leather Shoe and St. Jerome footwear factories, of St. Jerome, P. Q. Dominion Rubber, which won outstanding recognition from the National Safety Council last year, is again leading the international race for plant safety leadership this year in both large and small plants' sections of the rubber industry.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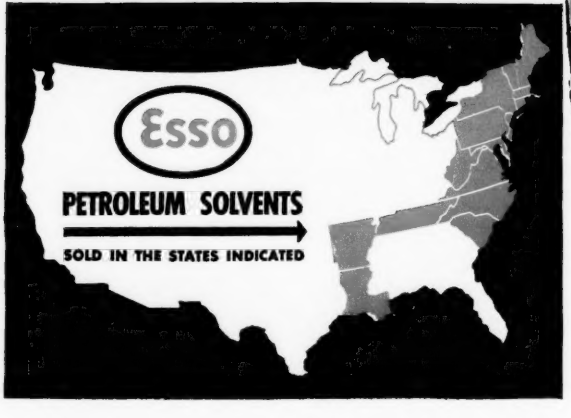

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Foresee No Tire Price Cut

No early price cuts in tires are foreseen by Canadian makers and dealers following recently announced 2¢ reductions in prices of natural and synthetic rubbers. Although there have been some substantial tire price reductions in the United States during the past few weeks, the Canadian tire position is quite different. United States tire prices underwent several price increases since 1940, while Canadian prices remained unchanged.

Other factors cited as more than offsetting the Canadian rubber price savings include last year's lengthy and costly "general" strike which is still reflected in the minimum Canadian rubber inventories. In addition, the cost of rayon cord in Canada is much higher than in the United States; while the raw cotton price of 30¢ per pound is almost triple the prewar price. Labor wages in Canada have risen sharply since 1945; while labor productivity is said to be at an all-time low level.

Leaver Head of Stokes Company

L. R. Leaver has been elected president of Joseph Stokes Rubber Co., Ltd., Welland, Ont. He formerly was vice president and director of the company, which is a subsidiary of Thermoid Co., Trenton, N. J., whose president, Fred Schluter is chairman of the board of the Canadian concern. Mr. Leaver, at one time vice president of Thermoid, has been directing head of Stokes for more than eight years, and under his leadership sales have increased, according to Mr. Schluter, from less than one million dollars a year to approximately four million for the current year.

W. D. Pardoe has been elected a director of Stokes. The board also includes, besides the new president and the chairman, L. J. Falkenhagen.

Since becoming affiliated with Thermoid in the latter part of 1943, the Stokes company has been greatly expanded and is at present undergoing further expansion to take care of greatly increased operations.

Farrel-Bertram Arrangement

Farrel-Birmingham Co., Inc., Ansonia, Conn., manufacturer of heavy industrial equipment, gears, and gear units, has completed an arrangement with John Bertram & Sons Co., Ltd., Dundas, Ont., Canada, whereby Farrel-Birmingham processing equipment for the manufacture of rubber and plastics, phonograph record machinery, rolling mill machinery, and hydraulic machinery will be built in Canada.

This affiliation joins the interests of two of the oldest machinery manufacturing companies in North America. Farrel-Birmingham will celebrate in 1948 the one hundredth anniversary of the founding of its Ansonia plant, and the Canadian firm, oldest and largest machine tool builder in the Dominion, was founded in 1861. Similarity between the two firms is marked in policy, in the hereditary craftsmanship of a large percentage of employes, and in the fact that both companies have remained in control of descendants of the founders.

The products of the two companies differ in type, but both produce machines which combine the characteristics of unusual mass and weight with precision workmanship so that Bertram's facilities are readily adaptable to the manufacture of the several types of Farrel-Birmingham equipment included in the agreement.

Bertram products consist of general-purpose and railroad machine tools and metal-working machines, also small machine tools and precision gages manufactured by a separate division of the company known as Pratt & Whitney of Canada. This variety of products has warranted the establishment of sales coverage throughout industrial Canada, and Farrel-Birmingham products manufactured by Bertram will now be procurable through the company's headquarters at Dundas and branch sales at Vancouver, Winnipeg, Windsor, Toronto, and Montreal.

Report on Polymer Corp.

Polymer Corp., Sarnia, Ont., was recently visited by Governor General and Viscountess Alexander. After a survey of the plant conducted by J. R. Nicholson, Polymer vice president and general manager, the party witnessed the making of GR-S rubber from the coagulation stage to the final baling and packaging, and inspected the styrene finishing plant. The visitors expressed keen interest in the extensive Dow projects and other developments in the new chemical industry growing in the St. Clair Valley. In accepting a souvenir album of Polymer plant pictures, the Governor praised the plant's wartime and peacetime contributions.

The recent tabling of the Polymer Corp. report together with the slump in crude rubber prices have focused attention on the present outlook of Canada's 50-million-dollar investment in the synthetic rubber business. The company's report states that 75% of sales in 1946 were of GR-S rubber, and that the average selling price was 19.6¢ per pound.

It is generally believed that Polymer can produce GR-S at a price of 15 to 16¢ per pound, assuming a high volume of sales and expansion of sales and profit from by-products. Recognition of present conditions is shown in the report which states, "From now on, it will be extremely difficult to market large quantities of GR-S," and also, "It is highly probable that the company will encounter a difficult period until such time as the qualities of GR-S are improved to such an extent that it is superior to crude rubber for bulk uses, or until the demand for other types of rubber which can be produced by the company increases."

Polymer's operating statement for the year ended March 31, 1947, shows the following sales breakdown: GR-S, $16,800,000; Butyl, $5,000,000; styrene, $640,000; steam, electricity, and water, $41,000; and total sales, $22,500,000. Operating profit on total operations was $4,300,000, and there was an additional profit of $238,000 on trading in imported rubber. On the debit side, sales and administrative costs were $531,000, including $160,000 applicable to imported rubber operations carried on for the government. A sum of $375,000 was written off for salaries and research expenses, leaving a net profit of $3,800,000 transferred to the surplus account.

Total cumulative profits since the company commenced operations are $8,600,000, of which approximately 45% was made in 1946-47. The cumulative surplus account shows the company to have written off $967,000 as "portion of administrative expenses capitalized during the period of plant construction commencing February, 1942." Also written into its accounts are $2,800,000 of reserves no longer needed in view of crude and imported rubber parchases. An almost identical amount has been deducted for depreciation of plant, equipment, etc. There has been a further deduction of $3,800,000 as distribution of profits to the government, leaving a net surplus of $3,900,000 transferred to the balance sheet at the end of the year.

The latest balance sheet shows total assets of $49,700,000, of which $38,000,000 is the depreciated values of land, buildings, equipment, etc. A footnote appended to the statement says that "Depreciation is chiefly computed on cost reduced by abnormal wartime costs of construction." This abnormal cost is estimated at $22,000,000, and since only half has been written off, the comment is made that "The balance sheet valuation is overstated to the extent that abnormal wartime construction costs are included and the deduction for depreciation is based on less than original cost." Speaking before the Public Accounts Committee, Auditor General Watson Seller said that Polymer should be put through the financial wringer and its accounts established on a basis that would show the true picture of its operations.

Rubber Footwear Outlook

With the gradual increase of supplies from the Far East, there has been a liberalizing of rubber controls, and Canadian manufacturers are now permitted to use two-thirds natural rubber to one-third synthetic in the production of rubber footwear. This is a welcome development from the factory standpoint as the synthetic, while otherwise satisfactory, is more difficult to handle and creates certain processing problems.

The settlement of the labor dispute has cleared another problem. In the plants of the three major rubber footwear producers that were affected, two of them in all lines and the other in heavy goods and boots, the striking employes have returned to work and prospects for the 1947-1948 season appear brighter. The increased cost of labor has made it necessary for the WPTB to grant an increase in wholesale prices that will advance the cost of footwear to the consumer by 10 to 25¢ per pair.

Goodyear Tire & Rubber Co. of Canada, Ltd., New Toronto, Ont., reports a rapid oversubscription of an offering of an additional 50,000 shares of 4% cumulative redeemable preferred stock, par $50, by A. E. Ames & Co. The stock, representing the remainder of the authorized, but unissued preferred shares, was offered at $52.50 a share to yield about 3.81% return. Proceeds of the issue will be used for the general corporate purposes of the company, it was stated.

Goodyear recently extended its facilities by the acquisition of additional premises, including a plant in Quebec which, when equipped, will be used to manufacture miscellaneous rubber products. In addition, two new factories are now under construction in New Toronto, for the manufacture of Airfoam and Pliofilm.

Accelerators
Plasticizers
Antioxidants

A Complete Line of Approved Compounding Materials

The C. P. Hall Co.
CHEMICAL MANUFACTURERS

AKRON, OHIO • LOS ANGELES, CALIF. • CHICAGO, ILL. • SAN FRANCISCO, CALIF.

Further to improve service to customers and dealers, the company has moved its Toronto branch sales office from 204 Richmond St. to a large building at Fleet and Bathurst Sts. Recently acquired by Goodyear, the building was remodeled to include improved office, warehouse, and shipping facilities.

Garnett T. Dickson, manager of customs and purchasing for Goodyear, is the new president of the National Association of Purchasing Agents.

OBITUARY

C. R. Bollinger

A CEREBRAL hemorrhage suffered two weeks before caused the death of Clarence R. Bollinger, vice president and secretary-treasurer of Goodyear Tire & Rubber Co's. plant near Buenos Aires, Argentina, on June 21 at British Hospital. He had spent 41 of his 55 years as a Goodyear employe.

A native of Akron, O., Mr. Bollinger held Goodyear's longest foreign service record, having served in Singapore, the Far East, and in Argentina. Joining Goodyear in 1906 as a messenger in Paul W. Litchfield's office, the deceased became active in the development and organization of several subsidiaries of the parent company. After working in the cashier's office in Akron for eight years he was transferred to Buenos Aires to take charge of finances. In 1929 he went to Singapore where he held a similiar position with Goodyear Orient Co. He returned to Akron in 1922 where, for eight years, he was affiliated with Goodyear's retail stores division. He returned to Argentina, 17 years ago.

Mr. Bollinger, a 32nd degree Mason, leaves a brother, two sisters, and three nieces.

Funeral services and burial were in Buenos Aires on June 23.

William J. Williams

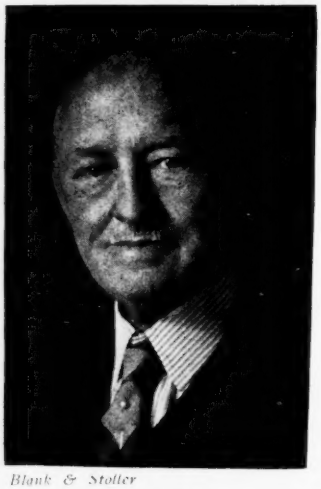
FUNERAL services were held on June 23 at Congregational Church, La Grange, Ill., for William John Williams, chairman of the board of the Williams-Bowman Rubber Co., Chicago. He died in a Chicago hospital on June 21.

A native of Chicago (January 30, 1876), Mr. Williams studied mechanical and electrical engineering at the Lewis Institute. Associated with the rubber industry since 1903 when he started as a jobber, he became president of his firm in 1909 and retained that position until 1944 when he was elected chairman of the board.

Mr. Williams, a 33rd degree Mason, was a member of the Mason Veterans Association of Illinois, Garfield Lodge No. 686, A.F.&A.M., York Chapter No. 148, R.A.M., Trinity Commandery No. 80, Medinah Temple, Oriental Consistory, Chicago Athletic and La Grange country clubs.

Interment was at Forest Home Cemetery.

Surviving Mr. Williams are his widow, two daughters, and four grandchildren.



Blank & Stoller

Joseph F. McLean

Joseph F. McLean

A PROMINENT figure in the rubber industry, Joseph F. McLean, passed away July 18 in a Paterson hospital after an illness of several weeks.

Born in New York, N. Y., in 1867, he came to Butler, N. J., in 1884 to work for the Butler Hard Rubber Co., now the American Hard Rubber Co., of which he became a director in 1929. In 1901 he founded the Pequanoc Rubber Co., to manufacture reclaimed rubber and was president of this company until his death. The deceased was also an active member and one of the founders of the Rubber Reclaimers Association.

For many years Mr. McLean was active in public affairs, having served as Morris County Collector from 1897 to 1918, Butler Councilman from 1909-1917, member of Butler Boro Sinking Fund Commission 1928-1946, and Mayor of Butler 1919-1920. Among his other activities he was director for many years of the First National Bank of Butler and a director of the Vulcanized Rubber Co., Morrisville, Pa. He was, moreover, a member of the Wool Club of New York, the Pica Club and the Hamilton Club of Paterson, Silentia Lodge F.&A.M., Boonton Chapter R.A.M., Salaam Temple A.A.O.N.M.S., Emanuel Lodge I.O.O.F., and an honorary member of Butler Rotary Club.

In his early twenties he married Miss Cora Gilland of Pompton Plains, by whom he is survived.

Mr. McLean's charities have been widespread, and he was always giving a helping hand to every cause or individual needing assistance. Mayor Harry Taylor of Butler issued a proclamation requesting all business places in the Boro to close from 2:00 to 4:00 p.m. July 21.

Funeral services were held at Richards' Funeral Parlor on July 21. Interment took place at the Fairmount Memorial in Newark.

FINANCIAL

DeVilbiss Co., Toledo, O., and subsidiaries. Year ended May 31: net profit, $1,042,376, equal to $3.46 each on 300,000 common shares.

Dewey & Almy Chemical Co., Cambridge, Mass. Initial half, 1947: net earnings, $335,351, or $1.09 each on 307,215 common shares, compared with $278,744, or 91¢ a share, a year earlier; net sales, $7,061,259, against $5,903,553.

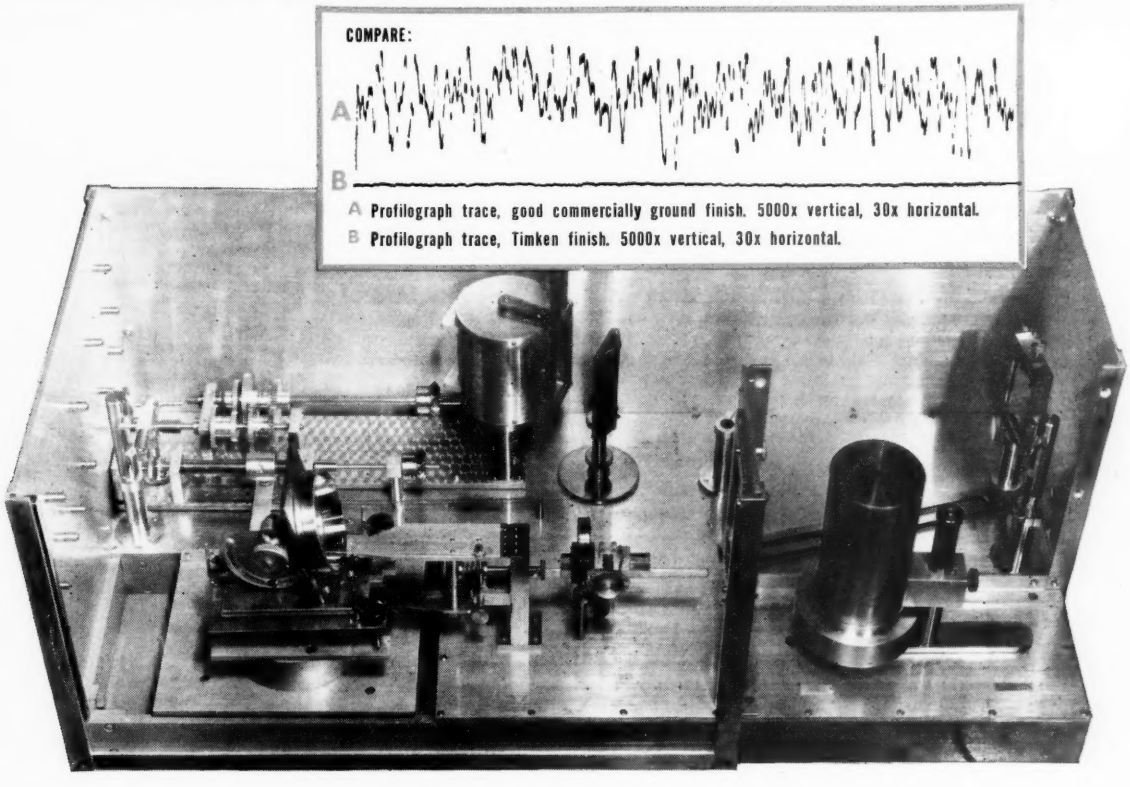
The Eagle-Picher Co., Cincinnati 1, O. Six months ended May 31, 1947: consolidated net profit, after appropriation of $2,600,000 to the reserve for decline in inventory values, $2,199,025.14, equal to $2.47 each on 889,076 common shares outstanding, compared with $898,536.62, at $1.01 a share, in the like period last year, when no reserve for inventory price decline was made; consolidated net sales; $39,991,447.71, against $19,859,857.84.

General Electric Co., Schenectady, N. Y. First half, 1947: net profit, $37,979,536, equal to $1.32 a common share, contrasted with net loss of $5,980,179 in the 1946 half when a strike was in progress for nine weeks; net sales, $537,757,070, against $222,031,300.

Dividends Declared

Company	Stock	Rate	Payable	Stock of Record
Anaconda Wire & Cable Co.	Com.	$3.00 irr.	July 22	July 11
Baldwin Rubber Co.	Com.	0.17½	July 25	July 15
Converse Rubber Co.	1st Pfd.	0.25 q.	July 8	July 1
Converse Rubber Co.	2nd Pfd.	0.20 q.	July 8	July 1
Dayton Rubber Mfg. Co.	Com.	0.30	July 25	July 10
Dayton Rubber Mfg. Co.	"A"	0.50 q.	July 25	July 10
Detroit Gasket & Mfg. Co.	Com.	0.12½	July 25	July 10
De Vilbiss Co.	Com.	0.25	July 21	July 10
Dunlop Rubber Co., Ltd.	A. D. R.	0.32 1/5 init.	July 9	May 26
Dunlop Tire & Rubber Goods Co., Ltd.	Pfd.	0.62½ s.	June 30	June 27
Dunlop Tire & Rubber Goods Co., Ltd.	5% Cum. 1st Pfd.	2½%	June 30	June 27
Electric Hose & Rubber Co.	Com.	0.10 extra	Aug. 21	Aug. 14
Electric Hose & Rubber Co.	Com.	0.30 q.	Aug. 21	Aug. 14
General Cable Corp.	Com.	0.25 init.	Aug. 1	July 1
General Electric Co.	Com.	0.40	July 25	.....
Gro-Cord Rubber Co.	Com.	0.10 q.	June 30	June 20
Hewitt-Robins, Inc.	Com.	0.25 q.	Aug. 26	Sept. 15
Okonite Co.	Com.	1.00	Aug. 1	July 17
Pharis Tire & Rubber Co.	Com.	0.15	July 10	June 27
Philadelphia Insulated Wire Co.	Com.	0.50 q.	Aug. 15	Aug. 1
Thermoid Co.	Pfd.	0.52½	Aug. 1	July 8
Union Asbestos & Rubber Co.	Com.	0.17½ q.	Oct. 2	Sept. 30
United States Rubber Co.	Com.	2.00 liquid.	Aug. 8	July 7
United States Rubber Co.	Com.	1.00	Sept. 8	Aug. 18
United States Rubber Co.	8% Non-Cum. 1st Pfd.	2.00	Sept. 8	Aug. 18
S. S. White Dental Mfg. Co.	Com.	0.37½ q.	Aug. 12	July 28

Timken bearings make good rubber machinery better . . . here's one of the reasons why:


COMPARE:
A
B
A Profilograph trace, good commercially ground finish. 5000x vertical, 30x horizontal.
B Profilograph trace, Timken finish. 5000x vertical, 30x horizontal.

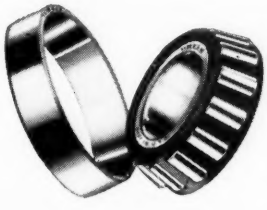
Answers the question— "How rough is smooth?"

ONE of the reasons Timken tapered roller bearings perform with such frictionless, wear-free ease is the amazingly smooth surface finish on the rolls and races —the finest known to modern bearing science.

Now, when you talk about finishes like this, you're talking about surface irregularities of only a few millionths of an inch—irregularities which are impossible to detect by any ordinary means. So, when Timken first began to develop this finish, one of the biggest obstacles was the absence of an accurate method of measuring the roughness of an apparently smooth surface.

The profilograph pictured above was the answer. Developed by Timken in 1928 and steadily improved since then, the profilograph determines surface irregularities to within one-millionth of an inch. Equipped with this measuring stick, Timken engineers were able to develop new finishing methods and machines, which have resulted in the microscopic surface accuracy of the Timken bearings you use today.

Every factor in the efficiency of a bearing is approached at Timken in this same scientific manner. For example, Timken makes its own steel to assure constant quality. And Timken is the acknowledged leader in: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. special analysis steels. No wonder you can always be sure of uniformly top quality and performance in the Timken bearings you use. The Timken Roller Bearing Company, Canton 6, Ohio.



TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◎ AND THRUST ◎ LOADS OR ANY COMBINATION ◎

Dow Chemical Co., Midland, Mich., and subsidiaries. Ten months ended March 31, 1947: net income, $9,948,141, equal to $7.15 each on 1,248,706 common shares outstanding; sales, $104,474,251.

General Cable Corp., New York, N. Y. First six months, 1947: net income, $3,265,910, equal to $1.48 a common share, contrasted with a net loss of $1,008,939 in the 1946 half, when work stoppages occurred at five plants.

General Tire & Rubber Co., Akron, O., and subsidiaries. Six months ended May 31, 1947: net profit, $2,650,912, equal to $4.06 each on 592,719 common shares, contrasted with $3,237,831, or 5.19 a share, a year earlier; net sales, $61,716,823, against $48,071,662; federal income taxes, $1,840,000, against $3,051,000; reserve for contingencies, $0, against $1,000,000.

Hercules Powder Co., Wilmington, Del. First half, 1947: net income, $7,312,900, equal to $2.69 each on 2,633,420 common shares outstanding, contrasted with $3,629,885, or $1.30 a share, in the first six months of 1946; taxes, $5,450,035, against $2,321,406; sales, $69,067,028, against $47,050,408.

Monsanto Chemical Co., St. Louis, Mo. First half, 1947: net income, $9,275,133, equal to $2.23 each on 3,963,163 common shares outstanding, against $6,185,234, or $1.48 each on 3,803,604 shares, in the like period last year; sales, $71,085,736, up 41%.

Phillips Petroleum Co., Bartlesville, Okla., and subsidiaries. Initial half, 1947: net profit, $15,459,699, equal to $3.14 a share, compared with $8,002,179, or $1.63 a share, in the 1946 half; provision for contingencies, $1,275,000, against $0; reserve for taxes, $6,003,000, against $2,464,900.

Plymouth Rubber Co., Inc., Canton, Mass. Six months ended May 31, 1947: net profit, $1,122,704, equal to $1.24 each on 900,000 common shares; sales, $6,265,762.

Rome Cable Corp., Rome, N. Y. Second quarter, 1947: net earnings, $367,774, equal to 91¢ a common share, against $233,488 in the like period last year.

Shell Union Oil Corp., New York, N. Y. Six months ended June 30: consolidated net income, $23,325,969, equal to $1.73 a capital share, against $15,090,389, or $1.12 a share, in the corresponding period of 1946.

Sun Oil Co., Philadelphia, Pa., and subsidiaries. First six months, 1947: net profit, $11,360,170, equal to $2.71 each on 4,119,224 common shares, against $4,360,212, or $1.21 each on 3,434,943 shares, in the initial period of 1946.

Viceroy Mfg. Co., Ltd., West Toronto, Ont., Canada. Year ended Febuary 28, 1947: net earnings, $80,231 equal to 62.7¢ each on 118,192 common shares, compared with $82,472, or 61.6¢ each on 100,000 common shares, in the preceding fiscal year; working capital, $739,260, against $388,074.

New Incorporations

Franklin Rubber, Inc., Los Angeles, Calif. 1,000 shares no par value capital stock. Directors, N. Handel, B. K. Brown, and H. Franklin, all of Los Angeles. To manufacture and deal in rubber goods and products of every kind.

Goodrich Athletic Products, Inc., Utica, N. Y. Capital stock, $20,000, $1 par. Directors, George A. and Grace A. Goodrich, both of New Hartford, N. Y., and Harry Elias, Utica. Manufacture and deal in athletic equipment and rubber goods.

Joints, Inc., Los Angeles, Calif. $75,000 capital. Directors, H. B. Green and R. M. Goldwater, both of North Hollywood, and S. E. Wright, Covina, both in Calif. To manufacture and deal in rubber products, plastics, etc.

Rogers Foam Rubber Co., Boston, Mass. Capital, $100,000. President and treasurer, J. H. Rogers; clerk, K. S. Rogers. To distribute and sell Goodyear Airfoam products.

Reduces Resin Prices

(*Continued from page* 654)

adhesives industry, 25%; and Pentalyn resins for the varnish, adhesives, and printing ink industries, 10 to 20%. According to the company, a major factor in these price reductions is the new resin plant at Burlington, N. J., which has recently swung into full operation and greatly contributed to operating and distributing economies.

1946 Production of Lead and Zinc Pigments

DESPITE the fact that 1946 was a full peacetime year, the lead and zinc pigments industry had to contend with a continuation of the unbalanced supply-demand relation that prevailed in the immediately preceding years, according to the Bureau of Mines, United States Department of the Interior. Demand for pigments as a whole was at near record levels, but shortages of essential raw materials made it impossible for producers to fill a large segment of requirements.

Shipments, in short tons, by domestic manufacturers during 1946 were as follows: basic lead sulfate and dry white lead, 41,892; litharge, 133, 799; red lead, 32,526; orange mineral, 123; zinc oxide, 157,851; leaded zinc oxide, 67,971; and lithopone, 147,001. Shipments, in short tons, of the pigments to the rubber industry during 1946 follow: litharge, 2,131; lithopone, 1,607; zinc oxide, 83,776; and leaded zinc oxide, 166. No figures are available on shipments of white lead, basic lead sulfate, orange mineral, and red lead to the rubber industry during 1946.

Rubber Preservative and Lubricant

VITENE, a liquid preservative and lubricant for rubber, is non-volatile, non-inflammable, and not harmful to the human skin, according to the manufacturer. While ordinary petroleum lubricants will swell rubber, Vitene has no swelling effect on either natural or synthetic rubbers and is stated to retard definitely premature hardening, oxidation, and subsequent deterioration of rubber. This preserving and lubricating effect can be obtained by applying a thin film of Vitene to the surfaces of a rubber article by spraying, wiping with a cloth, or by hand.

Suggested uses for the material cover many industrial fields. In the automotive industry Vitene is recommended for application to rubber chassis and body parts, tires both in use and in storage, and as a lubricant for mounting tires on rims. The mater is said to be of great value in the printing industry, being used to prevent premature hardening, cracking, and loss of tack of rubber blankets and rollers caused by ink driers and common cleansing compounds. While the product will not revive a completely dead roller, it is claimed when used daily, to more than double the life of a new roller. Another suggested application is for the prevention of hardening and surface glazing of typewriter rollers. Other possible uses cover rubber belting, hose, insulation, mats, gaskets, and other products in various fields.

Aromatics for Vinyl Coatings

THE Res-O-Dors, a group of new aromatics and masking agents especially designed for use in polyvinyl resin coatings, have been developed by the industrial aromatics division of Givaudan-Delawanna, Inc., 330 W. 42nd St., New York 18, N. Y. In the manufacture of some types of plastic coatings, particularly with polyvinyl resins, odor becomes a major problem. Although the resins are practically odorless, many of the plasticizers used have strong and obnoxious odors or, as with fatty acid derivatives, may develop a rancid odor.

The new Res-O-Dors are inexpensive because they are usable in small concentrations. They should be introduced when the plasticizer is mixed with the resin. They are easy to use, have pleasant odors not readily identifiable with any well-known aroma, and are extremely long lasting. They have been tested in coated fabrics and in finished consumer goods and, it is said, have no deleterious effect on the stability of the plastic material. They have no effect on the color of the plastics, except in the case of Res-O-Dor Nos. 9 and 10 which may cause a slight darkening and are therefore not recommended for use in light or transparent materials.

The group consists of Res-O-Dor Nos. 1 through 10, each with a distinctive odor and intended for different applications, such as food packaging, shower curtains, stuffed toy coverings, upholstery, clothing bags, women's accessories, and others.

NOW AVAILABLE COMMERCIALLY

PLASTOFRIES 62

A STABLE FLAMEPROOF PLASTICIZER

Manufactured for us exclusively by:

FRIES & FRIES, Inc.

Cincinnati, Ohio

PROPERTIES

PLASTOFRIES 62 is characterized by its non-inflammability, non-volatility, thermal and ultra-violet stability, and outstanding electrical properties. It is compatible with most commercial resins and elastomers and is particularly interesting for use with the vinyl copolymers, nitrocellulose, cellulose acetate, and cellulose mixed esters, such as the acetate-butyrate. In general compounds of these resins with PLASTOFRIES 62, when properly formulated, will not burn.

Some of the representative physical properties of PLASTOFRIES 62 are given below:

Boiling Point	— 220°C at 10 mm
Melting Point	— 25°C
Specific Gravity	— 1.369 @ 25°/4°C
Color	— Light straw to water white
Weight per Gallon	— 11.5 lbs.

SUGGESTED USES

WITH VINYL RESINS:

PLASTOFRIES 62 is compatible with polyvinyl chloride and the vinyl copolymers, and is suggested for use with these resins in unsupported films, extruded shapes, and for fabric coatings. PLASTOFRIES 62 is of particular interest in plastisol and organisol compositions.

WITH CELLULOSE ESTERS:

The fabric coating industry is turning to PLASTOFRIES 62 as a plasticizer for cellulose esters where non-inflammability is essential. PLASTOFRIES 62 is also suggested for trial in molding powders, film, and transparent sheeting based on ceiling esters.

WITH OTHER RESINS:

Because of its wide compatibility with many resins used in plastics and protective coatings, PLASTOFRIES 62 is worthy of test in other uses, particularly where non-inflammability, thermal and ultra-violet stability, good electrical properties and non-volatility are important.

OTHER USES:

PLASTOFRIES 62 is also suggested for use as an oil additive and in electrical equipment as a dielectric liquid.

Write for a sample and Technical Bulletin

SCHEER CHEMICAL Co., Inc.

60 East 42 St., New York 17, N. Y.

MUrray Hill 2-1941

SCHEER CHEMICAL CO. Inc.

Patents and Trade Marks

APPLICATION

United States

2,421,426. **Textile Roller Including an Arbor and a Sleeve-Like Cot of Rubber or Rubber-Like Material Mounted on the Arbor; This Cot Has Heat Dissipating Openings Extending from its Inner Arbor Contacting Face to Its Outer Face.** A. J. Maino, New Bedford, Mass.

2,421,594. **In an Arc-Welding Electrode Consisting of a Steel Core Covered with a Layer of Flux, a Continuous Outer Skin of a Tough Solid Polymer from the Class of Vinyl and Substituted Vinyl Compounds over the Flux.** R. H. F. Boot, assignor to Under Water Welders & Repairers Ltd., both of London, England.

2,421,621. **Protective Covering for Preventing Accumulation of Ice upon a Structure.** W. H. Hunter and W. C. Green, both of Akron, O., assignors to B. F. Goodrich Co., New York, N. Y.

2,421,623. **Abrasive Wheel Including Abrasive Grains Bonded by a Vitrified Ceramic Material and a Two-Phase Filler Including a Saturated Aliphatic Straight Chain Polymer Containing Chlorine Suspended and Held in Place within the Pores by Means of a Resin Matrix.** S. S. Kistler, West Boylston, assignor to Norton Co., Worcester, both in Mass.

2,421,640. **Insulating Tape Including a Body Impregnated with Polymerized Alpha Methyl Styrene.** A. A. New, S. G. Foord, and D. R. Beckwith, all of London, England, assignors to International Standard Electric Corp., New York, N. Y.

2,421,679. **Inflatable Life-Saving Boat.** G. H. Bingham, Jr., Lincoln, assignor to Cambridge Rubber Co., Cambridge, both in Mass.

2,421,728. **Hydraulic Brake.** H. Trevaskis, Birmingham, assignor to Dunlop Rubber Co., Ltd., London, both in England.

2,421,732. **Dimpling Tool Including a Body of Flowable Material for Transmitting Movement from the Holder of the Tool to a Sleeve Carried by the Holder.** O. W. Albert and D. A. Webster, assignors to Lockheed Aircraft Corp., all of Burbank, Calif.

2,421,792. **Detachable Boot and Shoe Heel.** E. H. Levine, New Britain, Conn.

2,421,808. **Liner for a Sink Formed of a Resilient Waterproof Material.** A. W. Robertson, Pittsburgh, assignor to Westinghouse Electric Corp., East Pittsburgh, both in Pa.

2,421,847. **In an Autoclave Closure Device, an Annular Elastic Gasket with a U-Shaped Cross-Section.** H. Pfleumer, New Brunswick, N. J., assignor to Rubatex Products, Inc., New York, N. Y.

2,422,092. **Traction Shoe for Removable and Replaceable Association with a Tired Automobile Wheel.** W. B. Gregg, Denver, Colo.

2,422,254. **Endless Tread Baby Carriage.** A. Peronti, Chicago, Ill.

2,422,377. **Pessary.** C. C. Waterbury, assignor to Diaphragm & Chemical Co., both of Chicago, Ill.

2,422,379. **Fluid-Tight Bushing.** S. E. Westman, Los Angeles, Calif., assignor to Bendix Aviation Corp., South Bend, Ind.

2,422,440. **Parachute and Elastic Suspension Line.** S. W. Severance, assignor to S. Swirlik, both of Trenton, N. J.

2,422,665. **For Securing a Magnesium Oxychloride Cementitious Wearing Surface to a Base in a Cement Floor, Wall, or the Like, an Interpolymer of Methyl Acrylate-Ethyl Acrylate.** R. H. Fredrickson, Minneapolis, and H. N. Stephens, White Bear Lake, assignors to Minnesota Mining & Mfg. Co., St. Paul, all in Minn.

2,422,725. **Wrapping Material Including a Plurality of Laminated Rubber Hydrochloride Sheets Combined Marginally into an Improved Seam Construction.** P. M. Gilfillan, assignor, by mesne assignments, to Shellmar Products Corp., both of Mount Vernon, O.

2,422,727. **Buoyant Electrode Including a Buoyant Center of Cellular Rubber Members Intercalated with Wooden Disks.** F. H. Gooding, Lodi, assignor to Okonite-Callender Cable Co., Inc., Paterson, both in N. J.

2,422,814. **Stamp Pad Including a Sponge Rubber Pad Member and a Normally Liquid-Tight Resilient Skin Member Disposed on the Flat Bottom Surface of the Base of the Stamp Pad.** C. F. Alexander, Chicago, Ill.

2,422,883. **In a Method of Flanging Sheet Metal, a Body of Material Having the General Characteristics of Rubber as a Forming Aid.** H. H. Bruderlin, Hermosa Beach, assignor to Douglas Aircraft Co., Inc., Santa Monica, both in Calif.

2,422,894. **Truss Including a Back Plate, a Hollow Resilient Air-Filled Casing Carried on the Back Plate, and Hollow Air-Filled Resilient Fingers Protruding from the Casing.** F. J. Grubb, Marshall, Mich.

2,422,925. **Resistance Unit for Battery Filler Plugs Including Soft Rubber Members.** W. J. Rady and L. A. Rice, both of Anderson, Ind., assignors to General Motors Corp., Detroit, Mich.

2,423,070. **In a Wheel Hub Brake, a Block of Elastically Deformable Material within the Brake Member between the Driving and the Anchor Members.** T. C. Sayles, Elmira, N. Y., assignors to Bendix Aviation Corp., South Bend, Ind.

Dominion of Canada

441,653. **In a Baby's Heat-Retaining Nursing Bottle Holder, a Resilient Rubber Breast Cap and a Rubber Support Means.** L. A. Lockwood, Chicago, Ill., U. S. A.

441,660. **Flexible Tube Including an Elastic Tubular Member Corrugated Internally and Externally, a Coil Spring Embedded in the Wall, and a Second Elastic Member Outside the Spring.** F. T. Roberts, Ridgefield, Conn., U. S. A.

441,705. **Members of Molded Plastic Material in a Hydraulic Damping Device.** Houdaille-Hershey Corp., Detroit, Mich., assignee of G. M. Magrum, Buffalo, N. Y., both in the U. S. A.

441,714. **In a Joint for an Electric Power Cable, a Wrapping of Tape of Acetylated Cotton Impregnated with Polystyrene and Rubber and a Filling of Polystyrene between a Sleeve over the Cable and the Wrapping.** Northern Electric Co., Ltd., Montreal, P. Q., assignee of E. C. Lee, London, England.

441,660. **Flexible Tube Including an Elastic Covering over a Central Conductor, and over the Covering a Coating Consisting of a Mixture of Reclaimed Rubber, Bituminous Material, and an Inert Filler.** Western Electric Co., Inc., assignee of Bell Telephone Laboratories, Inc., both of New York, N. Y., assignee of F. P. Farnsworth, Morristown, and J. H. Ingmanson, Rahway, both in N. J., both in the U. S. A.

441,738. **Electrical Conductor Insulated with a Layer of Normally Solid and Non-Charring Superpolyolefinic Insulating Material, Directly on the Conductive Stand.** Western Electric Co., Inc., New York, N. Y., assignee of G. R. Brown, Newark, N. J., both in the U. S. A.

441,768. **In an Accumulator, a Deformable Resilient Bag.** J. Mercier, New York, N. Y., U. S. A.

441,824. **In a Variable Resistor, a Plastic Member Formed of Material Subject to Plastic Deformation upon Application of an External Force thereto.** Baldwin Locomotive Works, Philadelphia, Pa., assignee of A. C. Ruge, Cambridge, Mass., both in the U. S. A.

441,874. **Leather-Like, Multi-Ply, Shoe Upper Material Having Elastic Properties and a Textile Inner Face and Plastic Outer Face, and Formed of Two Knitted Fabrics Bonded together by a Layer of Rubber.** Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of M. C. Teague, Ridgewood, N. J., U. S. A.

441,876. **Inflating Device for an Inflatable Receptacle Including a Bag With One End Permanently Secured to the Receptacle.** Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of V. H. Hurt, Cranston, R. I., U. S. A.

441,907. **In an Electrical Conductor Assembly, Relatively Strong and Elastic Locking Filament of Super Polyamide.** National Electric Products Corp., Pittsburgh, assignee of W. S. Robinson, Sewickley, both in Pa., and R. W. E. Moore, Riverdale, N. J., both in the U. S. A.

441,912. **Optical Device Including Optical Elements of Polystyrene United by a Film of Polyvinyl Resin.** Polaroid Corp., Cambridge, assignee of H. G. Rogers, Wellesley Hills, and L. Farney, Brookline, all in Mass., U. S. A.

441,937. **In an Underlay for Floor Coverings Including a Wood Core, a Lining Belt Bonded to the Core by a Film of Urea Resin Glue.** TekWood, Inc., Lakeport, assignee of B. M. Randall, Portsmouth, both in N. H., U. S. A.

441,938. **Cable Including an Electrically Conductive Center Surrounded by an Electrical Shield Enclosed in a Rubber Jacket.** United States Rubber Co., New York, N. Y., assignee of W. K. Priestly, West Barrington, R. I., both in the U. S. A.

441,965. **Resin-Fiber Article Including a Compacted and Bonded Assembly of Superimposed Interfelted Fibrous Layers and Resin.** Canal National Bank of Portland and W. Nulty, trustees, both of Portland, assignees of Keyes Fibre Co., assignee of E. E. Sawyer, both of Waterville, both in Me., U. S. A.

441,980. **Apparatus for Automatically Filling Fountain Pen Reservoirs.** O. Froidevaux, Antony, Seine, France.

441,984. **Water Seal for Drain Pipes, Etc.; the Seal Is Provided with Walls at Least Partly Consisting of Elastic Material.** H. Havrenius, Jonkoping, Sweden.

441,990. **Shoe Having an Insole and Counter Formed Integrally of Plastic Material.** C. C. Klaus, Highland, Ill., U. S. A.

442,004. **In Apparatus for Producing Pile Material, a Pair of Rubberized Fabric Belts for Advancing a Flat Web of Fiber Elements to Constitute the Pile.** V. A. Victor, Brooklyn, N. Y., U. S. A.

442,017. **In a Cop-Tube or Yarn Support for Textile Materials Including a Tubular Fiber Barrel, a Plastic Thimble Molded Around the Barrel End.** American Paper Tube Co., assignee of H. L. Amrhein and E. E. Fuller, all of Woonsocket, R. I., U. S. A.

442,132. **Rubber Pre-Shaped Floor Mat for Humped Automobile Floors.** Mishawaka Rubber & Woolen Mfg. Co., assignee of G. W. Blair and J. F. Schott, all of Mishawaka, Ind.

442,136. **Rubber Hydrochloride Insulated Electric Conductor.** O. A. J. van Lin, Venlo, and J. Hoekstra, Eindhoven, both in Holland.

442,138. **Syringe for Delivering a Multiplicity of Liquid Charges from a Reservoir.** H. H. Beasley, Portishead, Somersetshire, and A. Weeks, Bristol, both in England.

442,154. **In a Marine Propeller, an Annular Ring of Dielectric Material.** K. G. Glass, Vancouver, B. C.

442,185. **Solid Buffer of Synthetic Polymerized Resilient Material in a Percussion Tool.** C. S. Weyrandt, Indiana, Pa., U. S. A.

442,203. **In a Discharge Device, with at Least Two Conductive Parts Separated by an Insulating Member, Having an Exposed Surface Portion, a Water-Repellent Coating for the Portion Consisting of the Product Obtained by Hydrolyzing Methyldichlorosilane.** Canadian General Electric Co., Ltd., Toronto, Ont., assignee of H. E. Tanis, Jr., Schenectady, N. Y., U. S. A.

442,219. **Machine Bearing, the Load Bearing Surface of Which Consists of Polytetrafluorethylene Preponderantly.** Canadian Industries Ltd., Montreal, P. Q., assignee of R. M. Joyce, Jr., Wilmington, Del., U. S. A.

442,293. **Plastic Coated Venetian Blind Tape.** Hunter Engineering Co., assignee of J. L. Hunter, both of Riverside, Calif., U. S. A.

442,309. **Sectional Canoe and a Flexible Waterproof Cover.** Link Aviation Devices, Inc., assignee of F. A. Aimonetti, both of Binghampton, N. Y., U. S. A.

442,370. **Retractile, Elastic-Jacketed Cord.** Western Electric Co., Inc., assignee of Bell Telephone Laboratories, Inc., both of New York, N. Y., assignee of A. R. Kemp, Summit, and C. A. Webber, Westfield, both in N. J., both in the U. S. A.

442,445. **In a Foraminous Mold for Making Preformed Articles of Fibrous Material, a Perforate Mold Form and a Covering Sheet of Flexible Porous Elastomer.** Canadian Westinghouse Co., Ltd., Hamilton, Ont., assignee of H. A. Schwartz, North Braddock, Pa., U. S. A.

442,458. **Plastic Bonded Bobbin or Spool.** Freeland Spool & Bobbin Corp., assignee of G. B. Markle, Jr., both of Hazelton, Pa., U. S. A.

442,476. **In a Liquid Actuated Centrifugal Clutch Including Driving Means, an Annular Expansible Liquid Containing Gland Associated with the Driving Means.** Mercury Clutch Corp., Canton, O., assignee of A. M. Wickwire, Mountain Lakes, N. J., both in the U. S. A.

442,477. **Hinge Joint with Rubber Bushes.** Metalastik, Ltd., assignee of M. Goldschmidt and J. E. Moyal, all of Leicester, England.

United Kingdom

587,349. **Cables.** Okonite-Callender Cable Co., Inc.

587,372. **Liquid Seals for Centrifugal Pumps.** A. Abbey (Jonkopings Mekaniska Werkstads Aktiebolag).

587,440. **Floats.** W. T. Henley's Telegraph Works Co., Ltd., and P. Dunsheath.

587,441. **Floats.** W. T. Henley's Telegraph Works Co., Ltd., and H. A. MacDonald.

587,442-443. **Buoyant Cables and Electrodes therefor.** Okonite-Callender Cable Co., Inc.

587,450-451. **Buoyant Electric Cables and Electrodes therefor.** Okonite-Callender Cable Co., Inc.

587,795. **Laminated Materials.** E. I. du Pont de Nemours & Co., Inc.

587,828. **Seat or Like Cushion.** Dunlop Rubber Co., Ltd.

587,844. **Flexible Sheet Materials Including Coated Fabric.** Imperial Chemical Industries, Ltd., and A. Duerden.

587,958. **Insulation of High-Voltage Electrical Apparatus.** British Thomson-Houston Co., Ltd., and W. S. Melville.

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587,982. **Resilient Mountings.** Lord Mfg. Co.

588,137. **Vibration Damping Mountings for Optical Instruments.** Barr & Stroud Ltd., J. W. French, J. M. Strang, and C. D. Macgill.

588,320. **Typewriter Platens.** British Tire & Rubber Co., Ltd., W. Glover, and W. N. Evans.

588,436. **Buoyant Electric Cables.** Okonite-Callender Cable Co., Ltd.,

PROCESS

United States

2,421,625. **Process of Vulcanizing Rubber Which Includes Enclosing a Body of Unvulcanized Rubber in a Composite Covering Made up of Alternate Layers of Vulcanized and Unvulcanized Rubber.** H. E. Kretschmer, assignor, by mesne assignments, to British Insulated Cables, Ltd., of London, England.

2,422,348. **Embossed Microporous Battery Separator.** E. C. Uhlig, Greenwood, R. I., assignor to United States Rubber Co., New York, N. Y.

2,422,266. **Forming an Endless Power Transmission Belt by Means of a Mold Having an Endless Mold Cavity of the Desired Belt Cross Section, the Width of Which Is Defined by Spaced Outer and Inner Walls.** T. W. Steinke, assignor to Gates Rubber Co., both of Denver, Colo.

2,422,412. **Protecting a Surface Subjected to Abrasion with a Covering of Rubber and Tough Granular Material.** D. v. d. M. Haarhoff, Alberton, assignor to Anti-Abradants (Proprietary) Ltd., Johannesburg, both of Transvaal, Union of South Africa.

2,422,652. **Applying New Tread Material to Tires.** T. P. Bacon, Jr., Oakland, Calif.

2,422,797. **Gas-Expanded Cell-Tight Rubber.** H. Pfleumer, New Brunswick, N. J., assignor to Rubatex Products, Inc., New York, N. Y.

Dominion of Canada

441,743. **Rubber-Insulating a Metallic Article.** Western Electric Co., Inc., New York, N. Y., assignee of T. K. Cox, Randallston Md., both in the U. S. A.

441,873. **Laminated Cushion Material.** Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of G. W. Blair, Mishawaka, Inc., and V. H. Bodle, Alhambra, Calif., both in the U. S. A.

441,893. **Elastic Fabrics.** International Latex Processes, Ltd., London, England, assignee of T. C. Hawley, Jr., St. Paul, Minn., and N. Timenes, Waterbury, Conn., both in the U. S. A.

441,953-954. **Forming a Y-Type, Insulated, Rubber-Jacketed Cord.** Western Electric Co., Inc., New York, N. Y., assignee of S. M. Martin, Baltimore, Md., both in the U. S. A.

442,004. **Pile Material.** V. A. Victor, Brooklyn, N. Y., U. S. A.

442,050. **Relief Pattern Forming Method on Plastic Materials.** General Aniline Film Corp., New York, assignee of S. C. Slifkin, Binghamton, both in N. Y., U. S. A.

442,108. **Continuous Process of Producing a Waterproof Fabric.** Sylvania Industrial Corp., Fredericksburg, Va., assignee of C. S. Francis, Jr., West Harwich, Mass., both in the U. S. A.

442,269. **Improved Method of Making a Rubber-Backed Flexible Sound-Insulating Pad.** Consolidated Vultee Aircraft Corp., San Diego, Calif., assignee of O. R. Hoeltzel, W. Saville, and J. W. Larson, all of Fort Worth, Tex., both in the U. S. A.

United Kingdom

586,793. **Glass Fiber Synthetic Resin Laminates.** A. P. Thurston.

587,163. **Tubes or Packages.** Wingfoot Corp.

587,186. **Injection Molding of Plastic Materials.** J. Veit and J. F. Kenure.

587,191. **Sheets and Boards.** Imperial Chemical Industries, Ltd., and W. E. F. Gates.

587,282. **Molding Hollow Bodies from Plastic.** Ford Motor Co., Ltd.

587,603. **Manufacture of Capsules, Collapsible Tubes, and Similar Containers from Plastic Materials.** J. K. Power.

587,309. **Extensible, Contractible, Tubular, Annular, or the Like Film Products.** Soc. de la Viscose Francaise.

587,801. **Elastic Fabrics.** International Latex Processes, Ltd.

588,160. **Processing Natural Rubber.** D. Bridge & Co., Ltd., and J. Brown.

588,210. **Electric Insulators from Thermoplastic Cellulose Derivatives.** W. H. Moss.

588,411. **Filaments, Fibers, and Other Shaped Articles or Forms from Highly Polymeric Materials.** Imperial Chemical Industries, Ltd., E. G. Edwards, and R. J. W. Reynolds.

588,447. **Suedette Type of Sheet Material.** Dunlop Rubber Co., Ltd., J. Graham, and H. A. Hirst.

CHEMICAL

United States

2,421,392. **Oxygenated Products from a Saturated Aliphatic Hydrocarbon Subjected to the Action of Oxygen in the Presence of Hydrogen Bromide and an Organic Peroxide.** F. F. Rust, J. H. Raley, and W. E. Vaughan, all of Berkeley, Calif., assignors to Shell Development Co., San Francisco, both in Calif.

2,421,402. **Diaryl-Dialkyl-Ethane Derivatives.** E. Adler, Lidingo, Sweden, assignor to Hoffman-La Roche, Inc., Nutley, N. J.

2,421,408-409. **Extrudable Compostion Including a Vinyl Halide Polymer Mixed with a Plasticizer and a Chlorinated Paraffin Wax.** E. F. Broomman, and S. F. Pearce, Welwyn Garden City, England, assignors to Imperial Chemical Industries, Ltd., a corporation of Great Britain.

2,421,428. **Production of Maleic Acid and Maleic Anhydride by the Catalytic Oxidation of Furfural in the Vapor Phase.** E. R. Nielsen, assignor to Quaker Oats Co., both of Chicago, Ill.

2,421,441. **Purification and Drying of Methyl Chloride Containing Methanol Hydrochloric Acid, and Water.** E. A. Thronson, Lewiston, and A. I. Mendolia, Niagara Falls, both in N. Y., assignors to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,421,451. **Continuously Converting Aldol to 1, 3-Butylene Glycol.** F. R. Balcar, Stamford, Conn., assignor to Air Reduction Co., Inc., New York, N. Y.

2,421,506. **Low-Boiling Olefin.** J. P. Jones, Bartlesville, Okla., assignor to Phillips Petroleum Co., a corporation of Del.

2,421,544. **Vulcanizing Rubber or Rubber-Like Products in the Presence of Sulfur and a Powdered Fusion Product of Approximately One Mol of Zinc Chloride, One Mol to 2 Mols of a Monoarylguanidine, 2 to 8 Mols of Paraformaldehye and 2 to 8 Mols of Mercaptobenzothiazole.** E. W. Cook, New York, N. Y., and E. C. Hook, Norwalk, Conn., assignors to American Cyanamid Co., of New York N. Y.

2,421,545. **Oxidation of a High Molecular Weight Alkyl Mercaptan to a Disulfide.** W. W. Crouch, Bartlesville, Okla., assignor to Phillips Petroleum Co., a corporation of Del.

2,421,554. **Producing Isobutylene and Acetaldehyde by Contacting the Vapors of 2-Methylpentane-2, 4-Diol, with a Dehydration Catalyst Including Sodium Dihydrogen Phosphate on Activated Alumina, at a Temperature from 200 to 500°C.** H. de V. Finch, Berkeley, and S. A. Ballard, Oakland, assignors to Shell Development Co., San Francisco, all in Calif.

2,421,597. **Unsaturated Cyclic Ethers.** H. A. Bruson, assignor to Resinous Products & Chemical Co., both of Philadelphia, Pa.

2,421,627. **Reinforcing Compounding Material Including a Combination of Tall Oil and a Polymerized Cut of Coal-Tar-Type Solvent Naphtha Which Contains Polymers of Styrene, Polymers of the Various Isomeric Forms of Methyl Styrene, and Polymers of Coumarone and Indene.** C. G. La Cross, Baltimore, Md.

2,421,653. **Reaction Between a Hydrocarbon-Substituted Polysiloxane and a Halogenosilane.** R. O. Sauer, Schenectady, N. Y., assignor to General Electric Co., a corporation of N. Y.

2,421,831. **Single-Stage Production of Gas Expanded Rubber.** A. Cooper, Croydon, England, assignor to Rubatex Products., Inc., New York, N. Y.

2,421,837. **A 1-(2 Cyanoalkyl)-2-Hydrocynapthalene.** A. F. Hardman, assignor to Wingfoot Corp., both of Akron, O.

2,421,842. **In the Process of Treating Tall Oil, the Step of Esterifying This Oil with at Least One Polyhydric Alcohol in the Presence of at Least One Siliceous Catalyst.** F. C. Martin, Guttenberg, N. Y.

2,421,852. **Thermosetting Composition of Increased Tensile Strength from Vinyl Chloride-Vinylidene Chloride Copolymer Mixed with an Aliphatic Amine and a Heat-Hardenable Resin. Prepared by Condensation of One of the Phenols with One of the Aldehydes.** T. H. Rogers, Jr., and R. D. Vickers, assignors to Wingfoot Corp., all of Akron, O.

2,421,862. **Improved Process for Obtaining Large Yields of Polyhydric Alcohol by Reaction of Cyclic Formals with an Aliphatic Alcohol.** E. Arundale, Colonia, and L. A. Mikeska, Westfield, N. J., assignors to Standard Oil Development Co., a corporation of Del.

2,421,876. **Hard Resinous Product from a Mixture of Styrene, an Ester of Endomethylene Tetrahydrophthalic Acid, and a Glycol.** H. L. Gerhart, Milwaukee, Wis., assignor to Pittsburgh Plate Glass Co., Pittsburgh, Pa.

2,421,903. **Reacting Ethylene Chlorine and Water and Adding to the Reaction Mixture B,B' Dichloroethyl Ether to Produce Triglycol Dichloride.** J. C. Patrick, Morrisville, Pa., assignor to Thiokol Corp., Trenton, N. J.

2,421,937. **Imines.** V. E. Haury, El Cerrito, assignor to Shell Development Co., San Francisco, both in Calif.

2,421,946. **Producing Hydrocarbons of Higher Molecular Weight by Polymerizing an Olefinic Hydrocarbon in the Presence of Boron Trifluoride and Fluorosulfonic Acid.** V. N. Iaptieff, Chicago, and C. B. Linn, Riverside, assignors to Universal Oil Products Co., Chicago, both in Ill.

2,421,950. **Polymerization of Olefinic Hydrocarbons.** C. B. Linn, Riverside, assignor to Universal Oil Products Co., Chicago, both in Ill.

2,421,971. **Hydrolyzed Interpolymer of a Terminally Ethylenically Unsaturated Monoolefinic Hydrocarbon with a Vinyl Ester of a Monocarboxylic Acid.** C. A. Sperati, North Arlington, N. J., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,422,000. **Sulfoalkyl Ethers of Cellulose.** J. B. Dickey, Rochester, N. Y., and J. G. McNally, Oak Ridge, Tenn., assignors to Eastman Kodak Co., Rochester, N. Y.

2,422,017. **Finishing Articles of Cellulose Acetate by Treatment with a Solvent Mixture Including One of a Group of Acetone and Methyle Ethyl and One of a Group of Ethyl Lactate and Dioxane.** R. H. Hunt, Jr., Springfield, Mass., assignor to Monsanto Chemical Co., St. Louis, Mo.

2,422,029. **Bicyclic Compound Containing a Diphenylamine Nucleus.** J. G. McNally and J. B. Dickey, assignors to Eastman Kodak Co., all of Rochester, N. Y.

2,422,049. **Vulcanized Esters of Unsaturated Fatty Acids.** P. Stamberger, Dover, Del.

2,422,050. **Improved Method of Making 2-Amino-5-Substituted 1, 3, 4-Thiadiazole.** G. W. Steahly, assignor to Monsanto Chemical Co., both of St. Louis, Mo.

2,422,089. **Preparing Chlorinated Quinones from Amino-Substituted Benzene and Alpha-Amino-Substituted Naphthalene Compounds.** H. H. Fletcher, Nutley, N. J., assignor to United States Rubber Co., New York, N. Y.

2,422,153. **Ebonite Cured Composition Including the Reaction Product of a Copolymer of Butadiene and Styrene, Sulfur, a Fatty Acid, Boric Oxide, and a Non-Reactive Filler.** G. Van Nimwegen, C. V. Doenhoff, and C. E. Woodell, assignors to Carborundum Co., all of Niagara Falls, N. Y.

2,422,156. **Vulcanized Synthetic Rubber Products Including a Mixture of a Butadiene 1,3 Polymerizate and a Tertiary Alkyl Phenol Sulfide, in Which the Sulfur of the Phenol Sulfide Replaces a Corresponding Amount of the Sulfur Normally Required for Vulcanization.** G. M. Wolf, Wyandotte, and T. E. Deger, Grosse Ile, both in Mich., assignors to Sharples Chemicals, Inc., Philadelphia, Pa.

2,422,229. **Preparing Chlorinated Quinones from Phenolic Derivatives of Benzene and Alpha Hydroxynaphthalene Compoands.** H. H. Fletcher, Nutley, N. J., assignor to United States Rubber Co., New York, N. Y.

2,422,239. **In a Self-Sealing Fuel Container Made of Adherent Laminae, an Inner Layer Including a High Molecular Weight Rubber Polyester Amide Which Is the Reaction Product of a Hexamethylene Diisocyanate with the Lower Molecular Weight Polyester-Amide Including the Reaction of Adipic Acid, Ethylene Glycol, and Hexamethylene Diammonium Adipate.** H. S. Holt, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

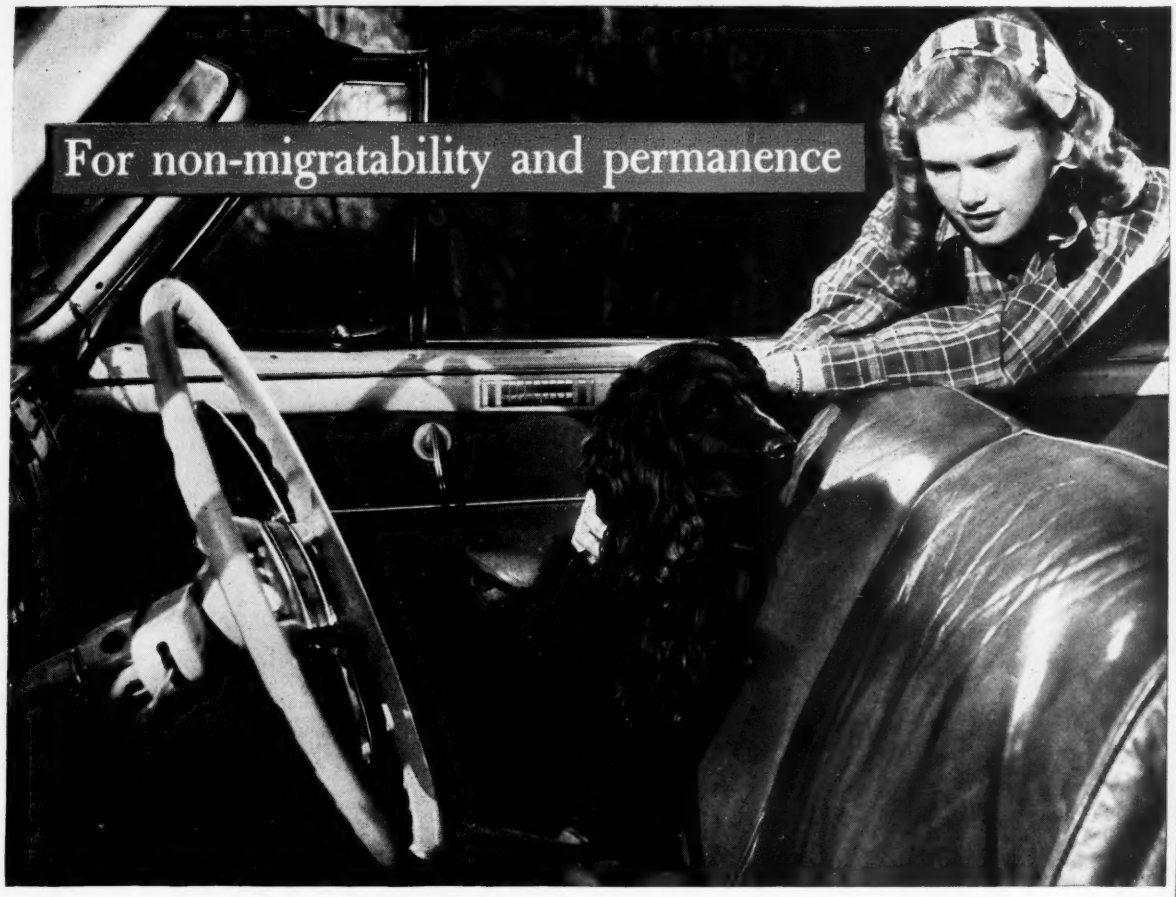
2,422,246. **Carboxylic Acids Vicinally Substituted with Two Mercapto Groups.** W. A. Lazier, Wilmington, A. A. Pavlic, Claymont, and W. J. Peppel, assignors to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, both in Del.

2,422,252. **Transposition of Dichlorobutenes.** J. A. Otto, Long Island City, assignor to General Chemical Co., New York, both in N. Y.

2,422,259. **Process Which Includes Heating a Mixture of Alkali Refined Linseed Oil and Low-Viscosity, Low-Hydroxyl Polyvinyl Butyral.** B. C. Pratt, assignor to E. I. du Pont de Nemours & Co., Inc., both of Wilmington, Del.

2,422,271. **Polyisocyanate Modified Polyesteramides.** G. T. Vaale and C. E. Frank, assignors to E. I. du Pont de Nemours & Co., Inc., all of Wilmington, Del.

2,422,346. **Conversion of Liquid Normal Butane to Isobutane.** G. L. Farrar, Dallas,



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Tex., assignor, by mesne assignments, to Socony-Vacuum Oil Co., Inc., New York, N. Y.

2,422,356. **A Resin Consisting of an Interestification and Interpolymerized Product of (1) an Acid Ester of an Hydroxylated Fatty Glyceride Oil with an Acid Component from the Group of Citric Acid, Malic Acid and Citric Acid with Lactic Acid, and (2) a Diethylene Glycol Ester of an Acid from the Group of Phthalic Acid and Adipic Acid.** E. A. Lasher, assignor to California Flaxseed Products Co., both of Los Angeles, **Calif.**

2,422,371. **Rubber-like Copolymer from a Mixture Containing a Conjugated Butadiene Hydrocarbon and an Alkyl Ester of Methacrylic Acid.** F. K. Schoenfeld, Silver Lake, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,422,392. **Ethylene-Vinyl Chloride Polymers.** M. M. Brubaker, Boothwyn, Pa., J. R. Roland, McDaniel Heights, Del., and M. D. Peterson, Oak Ridge, Tenn., assignors to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,422,486. **Composition Including Condensation Products of Sorbitan Mono Stearate and Ethylene Oxide as Emulsifying and Whipping Agent.** N. F. Johnston, Norwalk Conn., assignor to R. T. Vanderbilt Co., Inc., New York, N. Y.

2,422,503. **Compostion Including Alkaryl Amine and a Stabilizing Amount of Boric Acid.** R. K. Smith, Cranford, N. J., assignor to Standard Oil Development Co., a corporation of Del.

2,422,504. **Recovery of Lower Fatty Acids from Dilute Aqueous Solution.** O. Spence, assignor to Masonite Corp., both of Laurel, Miss.

2,422,528. **Tetrachlorosuccinonitrile.** O. W. Cass and H. R. Copelin, Niagara Falls, N. Y., assignors to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,422,550. **Copolymerization of a Natural Rubber with a Polymerizable Monoethelenically Unsaturated Compound.** R. A. Jacobson, Landenburg, Pa., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,422,578. **Reaction Products of Alkylenicimine with Ammonium Dithiocarbamate.** R. A. Mathes, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,422,623. **Production of Acetylene and Dry Calcium Hydroxide by Reacting Calcium Carbide with a Limited Amount of Water in a Dry-Generator.** H. Holler, Frankfort A. M., and O. Mues, Georgsmarienhutte, both in Germany; vested in the Attorney General of the United States.

2,422,631-632. **Aliphatic Amines and Acid Amides.** J. F. Olin and T. E. Deger, both of Gross Ile., Mich., assignors to Sharples Chemicals, Inc., Philadelphia, Pa.

2,422,637. **Resinous Condensation Product of Phenol Heated with Styrene Oxide.** C. A. Thomas, Dayton, O., assignor to Monsanto Chemical Co., St. Louis, Mo.

2,422,646. **Polymerizing an Emulsion of a Mixture of Vinyl Acetate and Vinyl Butoxy-Acetate in an Aqueous Solution of Polyvinyl Alcohol.** W. Starck, Hofheim, and H. Freudenberger, Frankfort a M.-Nied, both in Germany; vested in the Attorney General of the United States.

2,422,648. **Dihydropyran Compounds.** P. H. Williams, Berkeley, and S. A. Ballard, Oakland, assignors to Shell Development Co., San Francisco, both in Calif.

2,422,658. **Amine Salts of Dinitrophenols.** G. H. Coleman and F. B. Smith, assignors to Dow Chemical Co., all of Midland, Mich.

2,422,666. **Tough, Elastic, Rubbery Infusible Synthetic Linear Polycarbonamide Containing a Finely Dispersed Chromic Salt.** C. S. Fuller, Chatham, N. J., assignor to Bell Telephone Laboratories, Inc., New York, N. Y.

2,422,667. **Substituted 2, 4-Diaryl-Pyrrole Compounds.** E. P. Goodings and M. A. Rogers, Blackley, Manchester, England, assignors to Imperial Chemical Industries, Ltd., a corporation of Great Britain.

2,422,728. **Reaction of Beta-Lactone, Alcohol and Hydrogen Halide to Form a Beta-Halo Carboxylic Acid Ester.** T. L. Gresham and F. W. Shaver, both of Akron, O., assignors to B. F. Goodrich Co., New York, N. Y.

2,422,747. **High Impact Strength Plastic Material Suitable for Use as Water Containers Consisting of Ethyl Cellulose, Refined Mineral Oil, and Butyl Stearate.** J. Prichard, Bloomfield, and D. Flitter, Newark, both in N. J., assignors to Celanese Corp. of America, a corporation of Del.

2,422,754. **Polyvinyl Acetal Resins.** G. S. Stamatoff, Rutherford, N. J., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,422,798. **Hydrocarbon Conversion Process Including Reacting a Hydrocarbon in the Presence of a Catalyst Formed by Interacting an Aluminum Halide with an Olefine Ketone.** H. Pines, assignor to Universal Oil Products Co., both of Chicago, Ill.

2,422,802. **Production of a Methyl Pentadiene by Catalytically Dehydrating Diacetone Glycol.** W. T. Schelling, Oakland, and J. Anderson, Berkeley, assignors to Shell Development Co., San Francisco, all in Calif.

2,422,826. **Pure Mercaptans.** H. E. Drennan, Bartlesville, Okla., assignor to Phillips Petroleum Co., a corporation of Del.

2,422,859. **Nitriles of Unsaturated Acids.** W. A. Schulze and J. E. Mahan, both of Bartlesville, Okla., assignors to Phillips Petroleum Co., a corporation of Del.

2,422,919. **Chlorinated Polythenes.** J. R. Myles and P. J. Garner, Northwich, England, assignors to Imperial Chemical Industries, Ltd., a corporation of Great Britain.

2,422,926. **Higher Alkyl Aromatic Hydrocarbon Substituted Products from a Chlorinated Mineral Hydrocarbon Wax Condensed with an Aromatic Hydrocarbon, the Resultant Condensation Product Subsequently Sulfonated.** H. F. Reeves, Jr., assignor to Wyandotte Chemicals Corp., both of Wyandotte, Mich.

2,422,932. **Incorporating Sorbic Acid with a Butadiene-1, 3/Styrene Rubber to Improve Milling Characteristics.** H. E. Schroeder, Brandywine Hundred, and C. J. Mighton, Christiana Hundred, assignors to E. I. du Pont de Nemours & Co., Inc., Wilmington, all in Del.

2,422,991. **Isoparaffins from Olefins.** L. C. Strang, Sunbury-on-Thames, assignor by mesne assignments, to Anglo-Iranian Oil Co., Ltd., London, both in England.

2,422,993. **Thread, Filaments, and Films from Alginates.** E. E. Tallis, Meriden, assignor to Courtaulds, Ltd., London, both in England.

2,423,007. **Vulcanizing Rubber in the Presence of Sulfur, a Primary Organic Nitrogen-Containing Accelerator and a Compound of the Formula**

Where Aryl Is an Aromatic Nucleus of the Group of the Benzene, Napthalene, and Biphenyl Series. R. A. Coleman, Naugatuck, Conn., assignor to United States Rubber Co., New York, N. Y.

2,423,025. **Beta-Diethylaminoethyl, Beta, Beta-Diphenylpropionate.** R. B. Holmes, South River, N. J., and A. J. Hill, New Haven, Conn., assignors to American Cyanamid Co., New York, N. Y.

2,423,032. **Reclaiming Synthetic Rubber by Subjecting a Mixture thereof with a Monoamino Compound, Which Is Ammonia Having at Least One Hydrogen Atom thereof Replaced by a Monovalent Hydrocarbon Radical to Live Steam.** R. V. le Beau, Cambridge Mass., assignor by mesne assignment, to Midwest Rubber Reclaiming Co., East St. Louis, Ill.

2,423,033. **Reclaiming Vulcanized Synthetic Rubber by Heating with Live Steam in the Presence of a Saturated Fatty Acid, and a Solvent for the Acid Which Swells the Rubber.** R. V. Le Beau, Cambridge, Mass., assignor, by mesne assignments, to Midwest Rubber Reclaiming Co., East St. Louis, Ill.

2,423,042. **Polymerizable Mixed Ester of an Unsaturated Alpha, Beta Polycarboxylic Acid and Phthalic Acid and Ethylene Glycol.** I. E. Muskat, Plainfield, assignor to Marco Chemicals, Inc., Sewaren, both in N. J.

2,423,071. **Alicyclic Guanimines.** J. T. Thurston, Cos Cob, Conn., assignor to American Cyanamid Co., New York, N. Y.

Dominion of Canada

441,331. **Composition Including the Product of Polymerization of a Mass Including a Vinyl Halide, and a Polycarboxylic Acid Polyester of a Nuclearly Halogenated Aryl Ethyl Alcohol.** Canadian General Electric Co., Ltd., Toronto, Ont., assignee of G. F. D'Alelio, Northampton, Mass., U.S.A.

441,351. **Liquid Composition Suitable for Forming Seals at the Side Seams of Cans, Including Rubber and a Solvent for the Rubber Which is Gaseous at Normal Temperatures and Pressures.** Dewey & Almy Chemical Co., Cambridge, assignee of F. L. Chase, Jr., Arlington, and H. G. Maeder, Jr., Fitchburg, all in Mass., U.S.A.

441,392. **Waterproof Coating Composition Including a Wax Added to an Aqueous Dispersion of Polyvinyl Acetate.** Shawinigan Chemicals, Ltd., Montreal, assignee of G. O. Morrison and H. M. Collins, both of Shawinigan Falls, both in P. Q.

441,695. **Cold Set Adhesive for Gluing Wood Including (1) the Resinous Reaction Product of an Alkaline-Catalyzed Liquid Phenol-Aldehyde Condensation Product and a Derivative of a Carboxylic Acid Containing at Least 3 Carbon Atoms, and (2) an Aldehyde-Reactable Monohydroxy Aryl Sulfonic Acid Containing a Phenolic Hydroxy Radical.** Canadian General Electric Co., Ltd., Toronto, Ont., assignee of G. F. D'Alelio, Pittsfield, Mass., U. S. A.

441,717. **Production of Butadiene by Subjecting Anhydrous Vapors of 2,3-Dichlorbutane to Thermal Dehydrohalogenation.** Shell Development Co., San Antonio, assignee of G. W. Hearne and E. G. von Stietz, both of Berkeley, both in Calif., U. S. A., and H. P. A. Groll, Hamburg-Wellingsbuttel, Germany.

441,871. **Plastic Conversion Product of Elastic Polychloroprene Containing Combined therein 1,Mercapto-3,4-Dialkyl Thiazole.** Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of L. H. Howland, Cheshire, Conn., U. S. A.

441,872. **For Impregnating Fibrous Sheets, a Mixture Containing a Hydrazine Compound and a Polymerizable Mix of a Liquid Monomeric Unsaturated Polymerizable Compound Containing an Ethylenic Linkage and a Liquid Reactive Resinous Compound Obtained by Esterification of an Alpha-Beta-Unsaturated Organic Acid with a Polyhydric Alcohol, in the Presence of a Peroxide Catalyst.** Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of W. R. Hoover and R. M. Paulsen, both of Mishawaka, and S. V. Landgraf, Elkhart, both in Ind., U. S. A.

441,934. **Composition Including an Intimate Mixture Containing Polyvinyl Ester Resin, a Mineral Wax, and Unvulcanized Rubber and a Plasticizer for the Polyvinyl Ester.** Shawingan Chemicals, Ltd., Montreal, P. Q., assignee of G. J. Manson, Ottawa, Ont.

441,936. **Eraser Composition Including Abrasive and Coloring Matter, Polyvinyl Acetate, Dibutyl Phthalate and Rosin.** Sun Chemical Corp., formerly General Printing Ink Corp., assignee of S. H. Southard, both of New York, N. Y., U. S. A.

441,959. **Reacting a Mixture of Furfural, Sulfur, a Primary Aliphatic Amine and Hydrogen Sulfide, to Produce Amine Salts of Dithiofuroic Acid.** Wingfoot Corp., assignee of A. F. Hardman, both of Akron, O., U. S. A.

441,960. **Rubber Hydrochloride Film Plasticized with Enough of an Alkoxyalkyl Ester of an Unsaturated Fatty Acid to Increase Its Carbon-Dioxide Transmission Rate.** Wingfoot Corp., Akron, assignee of LaV. E. Cheyney, Columbus, both in O., U. S. A.

442,021. **Solution of Lignin Free of Water-Solubles.** Burgess Cellulose Co., Freeport, Ill., assignee of A. W. Schorger, Madison, Wis., both in the U. S. A.

442,022. **Resinous Composition Containing Substituted Alkyl Halides.** Canadian General Electric Co., Ltd., Toronto, Ont., assignee of G. F. D'Alelio, Pittsfield, Mass., U. S. A.

442,023-024. **Reaction Product of Aldehydes and Triazine Derivatives.** Canadian General Electric Co., Ltd., Toronto, Ont., assignee of G. F. D'Alelio and J. W. Underwood, both of Pittsfield, Mass., U. S. A.

442,025. **Hydroxy-Arylamino Triazine.** Canadian General Electric Co., Ltd., Toronto, Ont., assignee of G. F. D'Alelio, Pittsfield, Mass., U. S. A.

442,131. **In a Process for Bonding Rubber to Tire Cords Composed of Fibers of Regenerated Cellulose, Coating the Cords with a Solution of Rubber Dissolved in a Hydrophobe Liquid, Removing This Liquid, and Vulcanizing.** C. G. Bonard, London, England, administrator of the estate of H. Dreyfus, deceased, in his lifetime of London.

442,200. **Resinous Reaction Product of a Chlorinated Acetamide and a Product of Partial Reaction of Ingredients Including Formaldehyde and a Bis (Diamino Pyrimidyl Thio) Diethyl Ether.** Canadian Electric Co., Ltd., Toronto, Ont., assignee of G. F. D'Alelio and J. W. Underwood, both of Pittsfield, Mass., U. S. A.

442,204. **Reclaiming a Dimethyl Silicone Elastomer by Treatment with a Small Amount of Dimethyldihalogenosilane.** Canadian General Electric Co., Ltd., Toronto, Ont., assignee of J. G. E. Wright, Alplaus, and C. S. Oliver, Schenectady, both in N. Y., U. S. A.

442,207. **Reducing the Viscosity Characteristic of Cellulose Nitrate by Heating in an Aqueous Acid Solution of an Oxidizing Agent.** Canadian Industries, Ltd., Montreal, P. Q., assignee of J. R. Buckley, Parlin, N. J., U. S. A.

442,208. **A Relatively Rapid Low-Temperature Curing Polychloroprene Composition Including a Mixture of Uncured Polychloroprene, Sulfur Chloride, a Volatizable Liquid of the Class of Alcohols and Ketones Which Contain Less Than 6 Carbon Atoms, and an Inert Volatile Organic Solvent.** Canadian Industries, Ltd., Montreal, P. Q., assignee of L. S. Bake, Pennsgrove, N. J., U. S. A.

442,215. **Composition Including the Conjoint Polymerization Product of a Mixture of Vinyl Chloride and a Fumaric Ester, a Plasticizer for the Polymerization Product, and an Inorganic Basic Compound from the Group of Alkaline Earth Oxides, Alkaline Earth Hydroxides, Alkaline Earth Carbonates, and Alkali Metal Carbonates.** Canadian Industries, Ltd., Montreal, P. Q., assignee of H. Foster, Wilmington, Del., U. S. A.

442,216. **Composition Including an Amyl Imide of 3,6-Endomethylene-4-Cyclohexene-1, 2-Dicarboxylic Acid.** Canadian Industries, Ltd., Montreal, P. Q., assignee of E. W. Bousquet, Wilmington, Del., U. S. A.

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442,221. **Alkylsulfenyl Dimethyldithiocarbamate.** Canadian Industries, Ltd., Montreal, P. Q., assignee of M. Hunt, Claymont, Del., U. S. A.

442,223. **Composition Including Cellulose Acetate and a Plasticizer therefor Being Dimethyl Azelate.** Canadian Industries, Ltd., Montreal, P. Q., assignee of J. L. Quinn, Matawan, N. J., U. S. A.

442,224 **Polymer of Acrylonitrile.** Canadian Industries, Ltd., Montreal, P. Q., assignee of V. L. Hansley, Niagara Falls, N. Y., U. S. A.

442,225-227. **Acrylonitrile Polymer Solution.** Canadian Industries, Ltd., Montreal, P. Q., assignee of R. C. Houtz, Snyder, N. Y., U. S. A.

442,228. **Acrylonitrile Polymer Solution.** Canadian Industries, Ltd., Montreal, P. Q., assignee of A. O. Rogers, Lewiston, N. Y., U. S. A.

442,229. **Acrylonitrile Polymer Solution.** Canadian Industries, Ltd., Montreal, P. Q., assignee of R. C. Houtz, Snyder, N. Y., U.S.A.

442,230. **Acrylonitrile Polymer Solution.** Canadian Industries, Ltd., Montreal, P. Q., assignee of W. H. Charch, Buffalo, N. Y., U. S. A.

442,231. **Acrylonitrile Polymer Solution.** Canadian Industries, Ltd., Montreal, P. Q., assignee of R. R. Merner, Deerfield, Ill., U. S. A.

442,232. **Acrylonitrile Polymer Solution.** Canadian Industries, Ltd., Montreal, P. Q., assignee of A. O. Rogers, Lewiston, N. Y., U. S. A.

442,233. **Polyacrylonitrile Solution.** Canadian Industries, Ltd., Montreal, P. Q., assignee of R. C. Houtz, Snyder, N. Y., U. S. A.

442,235. **Resin-Dye Including a Resinous Polymerization Product of Styrene Joined through an Azo Linkage with an Azo-Dye-Coupling Component.** Canadian Kodak Co., Ltd., Toronto, Ont., assignee of W. O. Kenyon, L. M. Minsk, and G. P. Waugh, all of Rochester, N. Y., U. S. A.

442,271. **For an Article of Glass, a Priming Coat Including a Hydrolyzable Organosilicane and a Different Organic Coating Composition Applied to the Primed Surface.** Corning Glass Works, assignee of O. K. Johannson, both of Corning, N. Y., U. S. A.

442,292. **Vinyl Resin Composition.** B. F. Goodrich Co., New York, N. Y., assignee of T. L. Gresham, Akron, O., both in the U. S. A.

442,306. **Increasing the Viscosity of a Butyl Alcohol Solution of a Formaldehyde-Urea Reaction Product without Decreasing Its Compatibility with Hydrocarbons.** Libbey-Owens-Ford Glass Co., assignee of Plaskon Co., Inc., assignee of J. A. Murray and G. H. Metzger, all of Toledo, O., U. S. A.

442,307. **Preparing Acyl Guanidines.** Libbey-Owens-Ford Glass Co., assignee of Plaskon Co., Inc., assignee of J. K. Simons, all of Toledo, O., and W. I. Weaver, Pittsburgh, Pa., both in the U. S. A.

442,364. **Unsaturated Nitro Compound.** Visking Corp., assignee of M. H. Gold, both of Chicago, Ill., U. S. A.

442,390. **Producing a Heavy Coating of Plasticized Carboxylic-Acid Ester of Cellulose on an Openwork Reinforcing Structure without the Use of an Active Volatile Solvent for the Ester.** C. Dreyfus, New York, N. Y., U. S. A., assignee of W. H. Moss, London, England.

442,478. **Composition Consisting of Monomeric Styrene and a Phenol.** Monsanto Chemical Co., St. Louis, Mo., assignee of R. L. Heider, Dayton, O., both in the U. S. A.

442,499. **A Primary Mercaptan.** Shell Development Co., San Francisco, Calif., U. S. A., assignee of J. M. Hoeffelman and R. Berkenbosch, both of Amsterdam, The Netherlands.

442,500-501. **Di-Normal Propyl Thio-Ether.** Shell Development Co., San Francisco, assignee of F. F. Rust and W. E. Vaughan, both of Berkeley, both in Calif., U. S. A.

United Kingdom

587,328. **Stabilization of Cellulose Ethers.** E. P. Newton (Hercules Powder Co.).

587,333. **Resinous Compositions.** Imperial Chemical Industries, Ltd.

587,350. **Synthetic Resinous Products from Furfuryl Alcohol.** British Thomson-Houston Co., Ltd.

587,354. **Resinous Condensation Products.** British Industrial Plastics, Ltd., and A. Brookes.

587,378. **Ethylene and Ethylene Polymers.** Imperial Chemical Industries, Ltd., E. Hunter, G. P. Feachem, and R. B. Richards.

587,391. **Polymerization and Interpolymerization of Ethylene.** Imperial Chemical Industries, Ltd., I. L. Clifford, E. G. Williams, and R. B. Richards.

587,395. **Low-Temperature Polymerization Process.** J. C. Arnold (Standard Oil Development Co.).

587,396. **Catalysts.** C. Arnold (Standard Oil Development Co.).

587,403. **Composition and Textile Articles Having a Basis of Vinyl Polymers.** Carbide & Carbon Chemicals Corp.

587,434. **Heterocyclic Nitrogen Compounds.** Gevaert Photo-Producten Naamlooze Vennootschap, G. Schwarz, and P. de Smet.

587,439. **Polymeric Materials.** E. I. du Pont de Nemours & Co., Inc.

587,444. **Stabilized Vinyl Resins.** British Thomson-Houston Co., Ltd.

587,445. **Interpolymerization Products.** British Thomson-Houston Co., Ltd.

587,446. **Modification of the Properties of Polyamides.** Imperial Chemical Industries, Ltd., J. G. Cook, and R. C. Seymour.

587,455 **Polymerized Vinyl Products.** A Boake, Roberts & Co., Ltd. and B. T. D. Sully.

587,475. **Low-Temperature Catalystic Polymerization.** J. C. Arnold (Standard Oil Development Co.).

587,492. **Polymers of Unsaturated Esters.** Wingfoot Corp.

587,770. **Synthetic Manufacture of Urea.** Compagnie de Produits Chimiques et Electrometallurgiques Alais, Froges, et Camargue.

587,797. **Insolubilizing Vinyl Resins.** Carbide & Carbon Chemicals Corp.

587,804. **Polymerization of Chloroprene.** E. I. du Pont de Nemours & Co., Inc.

587,829. **Plasticized Compositions Derived from Resinous Polymers.** Carbide & Carbon Chemicals Corp.

587,830. **Vulcanization of Butyl Rubber.** E. I. du Pont de Nemours & Co., Inc.

587,833. **Lightweight Resinous Insulating and the Like Materials.** E. H. G. Sargent.

587,880. **Synthetic Resins.** Distillers Co., Ltd., J. J. P. Staudinger, B. K. Kelley, and C. A. Brighton.

587,899. **Protective Coatings for Plastic Glass.** United States Rubber Co.

587,907. **Biguanyl Compounds.** Imperial Chemical Industries, Ltd., B. R. Jacobs, and Z. E. Jolles.

587,914. **Phenolic Resins.** Shell Development Co.

587,928-930. **Compositions Containing Diazotizable Amines or Diazonium Salts Thereof.** American Cyanamid Co.

587,933. **Haloformates.** A. H. Stevens (Pittsburgh Plate Glass Co.).

587,969. **Halogenated Hydrocarbons.** Socony-Vacuum Oil Co.

587,977. **Polymeric Materials.** J. C. Arnold (Standard Oil Development Co.).

587,992. **Organic Nitrogen Compounds.** Imperial Chemical Industries, Ltd., and C. W. Scaife.

588,018. **Compositions Including Unsaturated Polymeric Materials and Alkane Dithiols.** Imperial Chemical Industries, Ltd.

588,025. **Modified Nitrocellulose Coating Compositions.** Imperial Chemical Industries, Ltd.

588,029. **Films.** Wingfoot Corp.

588,032. **Esters of Tertiaryamino Alcohols.** Lankro Chemicals Ltd., and E. M. Meade.

588,037. **Separation of C_5 Diolefins from Mixtures thereof with Other Hydrocarbons.** Standard Oil Development Co. and J. C. Arnold.

588,041. **Polymerization of Ethenoid Compounds.** Distillers Co., Ltd., J. J. P. Staudinger, and D. Cleverdon.

588,058. **Stabilization of Vinyl Resins.** Wingfoot Corp.

588,099. **Catalytic Production of Phenolic Compounds.** Shell Development Co.

588,143. **Polymerization of Ethylene.** Carbide & Carbon Chemicals Corp.

588,353. **Factice and Sulfurized Oils.** Anchor Chemical Co., Ltd., and K. C. Roberts.

588,377. **Furan Derivatives.** Imperial Chemical Industries Ltd., J. G. M. Bremner, and D. G. Jones.

588,425. **Coating Compositions.** Imperial Chemical Industries, Ltd.

588,426. **Improved Heat Curable Sheet Materials.** Imperial Chemical Industries, Ltd., (E. I. du Pont de Nemours & Co., Inc.).

588,435. **Sheet Material Including Polyvinyl Chloride Compositions.** Imperial Chemical Industries, Ltd., and N. H. Brown.

588,475. **Polymeric Materials.** E. I. du Pont de Nemours & Co., Inc.

588,497. **Highly Polymeric Linear Esters and Filaments, Fibers, and Films thereof.** Imperial Chemical Industries, Ltd., J. G. Cook, J. T. Dickson, and H. P. W. Huggill.

MACHINERY

United States

2,422,480. **Rubber Treating Machine.** W. A. Gordon, Shelton, assignor to Farrel-Birmingham Co., Inc., Ansonia, both in Conn.

2,422,676. **Apparatus for Producing a Waterproof Seam for Polyvinyl Resinous Coated Fabrics.** H. H. Haman and J. A. Ritzler, assignors to Warren Featherbone Co., all of Three Oaks, Mich.

2,422,722. **Extrusion Apparatus.** F. J. Fielitz, North Arlington, N. J., assignor to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,422,788. **Retread Vulcanizer.** H. T. Kraft, assignor to General Tire & Rubber Co., both of Akron, O.

2,422,953. **Apparatus and Process for Extruding Material, Especially a Thermosetting Resinous Composition.** D. N. Davies and F. H. Churchman, assignors to Cellomold, Ltd., all of Feltham, Middlesex, England.

United Kingdom

587,367. **Fluid Pressure Cooling Chambers Associated with Extrusion Apparatus.** Pirelli-General Cable Works, Ltd., and R. E. Horley.

588,170. **Molds for Shaping and Vulcanizing Tires.** Dunlop Rubber Co., Ltd., and T. E. Davies.

588,273. **Apparatus for Thermoplastic Injection Molding.** Bakelite, Ltd.

588,305. **Apparatus for Manufacturing Resilient Cemented Carbide Articles.** British Thomson-Houston Co., Ltd.

588,431. **Machines for the Recovery of Rubber from Tires.** Northwestern Rubber Co. and C. H. Jones.

588,481. **Fluid Pressure Press.** North British Rubber Co., Ltd., and R. J. Aspey.

UNCLASSIFIED

United States

2,421,617. **Removing an Electrically Insulating Coating Including a Polyvinyl Acetal Resin from an Electrical Conductor.** P. Holmes, Stretford, England, assignor to Metropolitan-Vickers Electrical Co., Ltd., a company of Great Britain.

2,421,856. **Tire Replacing Tool.** O. V. Teegarden, Goshen, Ind.

2,422,023. **Tread Plate for Vehicle Tires.** R. A. Kropp, River Forest, assignor to Kropp Forge Co., Cicero, both in Ill.

2,422,078. **Improving the Tensile Strength of Cellulosic Fibers by Brief Treatment with an Aqueous Solution Including an Alkali-metal Salt of Acids of "Run" Native Congo Copal Resin.** H. M. Buckwalter, Detroit, Mich., assignor to United States Rubber Co., New York, N. Y.

2,422,288. **Electrical Insulation Tester.** W. D. Boynton, Woodbrook, Md., assignor to Western Electric Co., Inc., New York, N. Y.

2,422,467. **Tire Loosening Tool.** W. R. Carroll, Washington, D. C.

2,422,595. **Anti-Skid Device.** A. K. Stevens, Buffalo, N. Y.

2,422,624. **Inflation Apparatus for Ice-Removing Mechanism.** W. H. Hunter, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,422,744. **Auxiliary Jet Power Means for Aircraft.** W. F. O'Neil, assignor to General Tire & Rubber Co., both of Akron, O.

2,422,848. **Tire Lifting Tool.** W. R. Peters, Yreka, Calif.

2,422,903. **Electrolytically Treating Stainless Steel Articles Which Are to Have a Rubber Surface.** K. M. Huston, Baltimore, Md., assignor to Western Electric Co., Inc., New York, N. Y.

Dominion of Canada

441,875. **Method of Assembling a Heel Member in an Assembly Including an Insole with Heel Covering Attached thereto.** Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of I. F. Startner, South Bend, Ind., U. S. A.

441,877. **Composite Metallic Article.** Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of E. H. Wallace, Detroit, Mich., U. S. A.

441,878. **Dish Towel Having Good Drying and Polishing Qualities.** Dominion Rubber Co., Ltd., Montreal, P. Q., assignee of B. H. Foster, Maplewood, and H. E. Sunbury, Rutherford, both in N. J., U. S. A.

442,472. **Tool for Winding Tape on to a Cable or the Like.** International Standard Electric Corp., New York, N. Y., U. S. A., assignee of A. J. Maddock, London, England.

United Kingdom

587,322 **Fasteners for Driving Belts.** C. H. Baddeley and C. J. Bloodworth.

587,417. **Electric Insulating Testing.** A. Reyrolle & Co., Ltd., J. A. Harle, and R. I. Morgan.

587,361. **Pneumatic Tires Inflater.** F. J. Camm.

588,171. **Liquid Rheostats.** Dunlop Rubber Co., Ltd.

588,420. **Electrical Apparatus for Measuring the Potential of an Electrostatic Charge.** Dunlop Rubber Co., Ltd., and D. Bulgin.

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TRADE MARKS

United States

429,882. **Off-Timers.** Footwear. I. B. Kleinert Rubber Co., New York, N. Y.

429,906. A geometric figure containing the word: **"Miracle."** Adhesives. Miracle Adhesives Corp., Newark, N. J.

429,909. **Brubalcol.** Cement. Brunswick-Balke-Collender Co., Chicago, Ill.

429,945. **lord douglas.** Raincoats, suspenders, garters, etc. Emtee Slacks, Inc., New York, N. Y.

429,954. **Maternity.** Arch supports. Scholl Mfg. Co., Inc., Chicago, Ill.

429,963. **Weather-Prufe.** Rainwear. Franz Mayer Co., New York, N. Y.

429,972. Representation of an oblong containing a silhouette of a row of buildings and a sunblaze in the sky above the buildings. Cements. Cedtain-Teed Products Corp., Chicago, Ill.

430,002. **Victoseal.** Plastic materials and synthetic resins. Celluplastic Corp., Newark, N. J.

430,004. **Sto Aways.** Goggles. Watchemoket Optical Co., Inc., Providence, R. I.

430,043. Representation of a rain cloud containing the words: **"Raynon Rainwear."** Rainwear. Whitewater Raincoat Co., Whitewater, Wis.

430,048. **Pennsylvania.** Balls. Pennsylvania Rubber Co., Jeannette, Pa.

430,116. **Dunlop Pillo-Foam.** Gymnasium pads. Dunlop Tire & Rubber Corp., Buffalo, N. Y.

430,117. **Dunlop Pillo-Foam.** Operating table pads. Dunlop Tire & Rubber Corp., Buffalo, N. Y.

430,133. **Lighter Lite.** Electrical extension cords. Lighter-Lite Products, Chicago, Ill.

430,176. **Elastaplast.** Laminated fabric with elastic fabric backing. Alfred Vamos, Inc., New York, N. Y.

430,178. Representation of a circle containing two quarter segments in color and the word: **"Flexvac."** Flexible moistureproof bags. Standard Cap & Seal Corp., Chicago, Ill.

430,195. **Covinylblak.** Product composed of carbon black, artificial resin, and plasticizer. Binney & Smith Co., New York, N. Y.

430,221. **Vultrol.** Vulcanization controller. B. F. Goodrich Co., Akron, O.

430,237. **Phygon.** Fungicides. United States Rubber Co., New York, N. Y.

430,238. **Syndeet.** Insecticides. United States Rubber Co., New York, N. Y.

430,251. **Indonex.** Plasticizer. Standard Oil Co., Whiting, Ind.

430,256. **Semicon.** Tape. Okonite Co., Passaic, N. J.

430,360. **Diasmol.** Perfume base. United States Rubber Co., New York, N. Y.

430,362. **Califlux.** Plasticizer. Golden Bear Oil Co., Los Angeles, Calif.

430,393. **GenteX.** Wires and cables. General Cable Corp., New York, N. Y.

430,396. **Amberlite.** Synthetic resin bonder. Resinous Products & Chemical Co., Philadelphia, Pa.

430,407. Representation of a circle containing the words: **"Diamond Wire."** Wire. Diamond Wire & Cable Co., Chicago, Ill.

430,424. Representation of an oblong containing a warrior with the words: **"The Transparent Trojans"** and **"Rubber Prophylactics."** Prophylactic articles. Youngs Rubber Corp., New York, N. Y.

430,425. **Sleepwell.** Ear plugs. E. C. Hamphill, doing business as Sleep Shade Co, San Francisco, Calif.

430,442. **Lyk-Nu.** Tire cleaner and dressing, dressing for restoring and refinishing rubber mats, and rubber restoring liquid. A. A. Banks, doing business as Lyk-Nu Co., New York, N. Y.

430,447. **Tri-Plastic.** Polyvinyl resin sheets or films. R. S. Harte, San Francisco, Calif.

430,454. **Diminutives.** Clothing including foundation garments and rainwear. M. Frocks, New York, N. Y.

430,488. **"Strap-O-Moc."** Footwear. Shoes Associated, Inc., New York, N. Y.

430,498. **Alfred Norton.** Raincoats. Alfred Norton, Ltd., New York, N. Y.

430,516. **Magnifico.** Vinyl-type plastic sheeting. Crest Fabrics Corp., New York, N. Y.

430,519. **Sir Little.** Raincoats. Little Mfg. Corp., New York, N. Y.

430,545. **Haftson.** Cords, sockets, plugs, etc. Haft & Sons, Inc., Brooklyn, N. Y.

430,550. Representation of a circle containing the word: **"Danbury"** outlining a triangle containing the letter: **"D."** Soles and heels. Danbury Rubber Co., Inc., Danbury, Conn.

430,568. **Foamex.** Arch cushions, insoles, hat padding, etc. Firestone Tire & Rubber Co., Akron, O.

430,575. **Airworthy.** Raincoats. Duchess Royal, New York, N. Y.

430,576. **Seaworthy.** Raincoats. Duchess Royal, New York, N. Y.

430,577. **Dunlop Pillo-Foam.** Rug pads. Dunlop Tire & Rubber Corp., Buffalo, N. Y.

430,580. **Bemis.** Tents, tarpaulins, and waterproofed fabric covers. Bemis Bag Co., St. Louis, Mo.

430,584. **Arrafilm.** Leather substitute. B. F. Goodrich Co., doing business as Hood Rubber Co., New York, N. Y.

430,589. Representation of two-pine-treed hills with the words: **"Oldtown Trampeze."** Footwear. Penobscot Shoe Co., Old Town, Me.

430,591. **Quali Craft.** Footwear. Edison Bros. Stores, Inc., St. Louis, Mo.

430,612. **Hitex.** Artificial leather. Stedfast Rubber Co., Inc., Mattapan, Mass

430,614. **Kali-sten-iks.** Footwear. Gilbert Shoe Co., Thiensville, Wis.

430,620. **Twenty-Ones.** Footwear. General Shoe Corp., Nashville, Tenn.

430,627. Representation of a label containing the words: **"The Bates Shoe."** Footwear Bates Shoe Co., Webster, Mass.

430,629. Representation of a turtle with the word: **"Turtle."** Raincoats. Marathon Raincoat Mfg. Co., New York, N. Y.

430,633. **Panolene.** Soles. Panther-Panco Rubber Co., Inc., Chelsea, Mass.

430,629. Representation of a letter: "C" containing the letters: **"TP"** and around the outside, the word: **"Cen-ta-plas."** Bibs, panties, rainwear, etc. Century Textile Products, New York, N. Y.

430,653. Representation of a futuristic figure holding an open umbrella in the rain. Rainwear. Van Baalen Heilbrun & Co., New York, N. Y.

430,662. **"Typhoon."** Rainwear. H. W. Dean, New York, N. Y.

430,723. **Atomic.** Golf balls. Worthington Ball Co., Elyria, O.

430,762. **Gen O San.** Vaginal syringes. Diehl Research Laboratories, Ltd., Los Angeles, Calif.

430,782. Representation of an oblong containing the word: **"Habirdure."** Wire. Phelps Dodge Copper Products Corp., New York, N. Y.

430,825. **DC.** Insulation. Dow Corning Corp., Midland, Mich.

430,876. **Bomze Grip.** Bowling balls. J. Bomze, Detroit, Mich.

430,878. **SelForm.** Arch supports. Selform Arch Co., Inc., Boston, Mass.

CALENDAR

Sept. 1-4. **ASME. Fall Meeting. Hotel Utah, Salt Lake City, Utah.**

Sept. 12. **Chicago Rubber Group.**

Sept. 12. **Philadelphia Rubber Group. Annual Outing. Oak Terrace Country Club, Ambler, Pa.**

Sept. 17-19. **Division of Rubber Chemistry, American Chemical Society. Fall Meeting. Hotel Commodore, New York, N. Y.**

Sept. 27. **Connecticut Rubber Group. Annual Outing. Eichner's Grove, Trumbull, Conn.**

Oct. 3. **Boston Rubber Group. Fall Meeting. Hotel Somerset, Boston, Mass.**

Oct. 4-6. **National Association of Waste Material Dealers, Inc. Fall Convention. Ritz-Carlton Hotel, Atlantic City, N. J.**

Oct. 6-7. **Packaging Machinery Manufacturers Institute. Fifteenth Annual Meeting. Hotel Sheraton, Springfield, Mass.**

Oct. 7. **The Los Angeles Rubber Group, Inc.**

Oct. 9. **Southern Ohio Rubber Group. Gem City Club, Dayton, O.**

Oct. 21-25. **First Pacific Chemical Exposition. Civic Auditorium.**

Oct. 24. **New York Rubber Group. Fall Meeting. Hotel McAlpin, New York, N. Y.,**

Oct. 31. **Chicago Rubber Group.**

Dec. 1-6. **Twenty-First Exposition of Chemical Industries. Grand Central Palace, New York, N. Y.**

Dec. 2-5. **American Society of Mechanical Engineers. Annual Meeting.**

OTS Bibliography Reports

(Continued from page 659)

Performance of S-5 Synthetic Rayon Aircraft Tires. Lewis V. Coursen. (AAF, Engineering Division. ENG-56-M4135, Add. V.) PB 10105. 1944. 37 pages. Photostat $3; microfilm 50¢. Tests showed S-5 rayon tires in three sizes are suitable for aircraft use in accordance with program set forth in PB 10102 (below). A discussion is given of the test and the results obtained. Tables are included on constructional details of the tires, the performance data, and performance data on the red medallion markers used to aid the reclaimer in segregating synthetic tires.

Service Test Program for Synthetic Aircraft Tires. L. V. Coursen. (AAF, Engineering Division. ENG-M-56-4135, Add. II.) PB 10102. 1943. 7 pages. Photostat $1; microfilm 50¢. This report records the program for testing synthetic aircraft tires. Two test programs are given: (1) to determine if larger sizes of tires in the S-5 construction are adequate; and (2) to determine if the S-5 construction itself is adequate. For test results, see PB 10105 (above).

Measurement of Refractive Index and Determination of the Styrene Content of GR-S Copolymers. Irving Madorsky and Lawrence A. Wood. (RRC Research and Development Section, Polymer Research Branch, RRC No. GR-21.) PB 9692. 1944. 6 pages. Photostat $1: microfilm 50¢. The refractive index of a given rubber hydrocarbon is a physical constant dependent only on molecular structure. Combustion analysis is the only absolute method to determine the ratio of copolymers. This method is employed by the Bureau of Standards in this report. When applied to a "standard" copolymer, it yielded a styrene value of 22.94 ±0.13%, and the refractive index was 1.5341. These measurements are taken as a basis for the fundamental calibration of the refractometer used at the Bureau of Standards to measure the styrene content of commercial copolymers. By combining the observations for a polymer with 0% styrene with those for one containing 22.94%, one concludes that over this range the styrene content increases at an average rate of 0.122% for each unit in the fourth place of the refractive index number. This can be expressed by an equation.

(To be continued)

Foreign Trade Opportunities

The firms and individuals listed below have recently expressed their interest in buying in the United States or in United States representations. Additional information concerning each import or export opportunity, including a World Trade Directory Report, is available to qualified United States firms and may be obtained upon inquiry from the Commercial Intelligence Unit of the United States Department of Commerce, or through its field offices, for $1 each. Interested United States companies should correspond directly with the concerns listed concerning any projected business arrangements.

Import Opportunities

José Menasseh Nahon, representing Nahon & Irmão, Rua 13 de Maio 108, Belem, Para, Brazil: gutta balata.

Société Superflexit, 2 Rue du Parc, Bois-Colombes (Seine), France: plastics, rubber castings.

Caoutchouc & Ebonite, Seneffe, Belgium: rubber goods such as floor coverings, erasers, rugs, joints, heels, automatic parts, and sheets.

Kayalakakam Mathai George, representing Kayalakakam Co., Mattancherry, Cochin, South India: rubber.

F. J. Barretto, 51 Robinson Rd., representing Barretto Shipping & Trading Co., Ltd., 48 Winchester House, Collyer Quay, and Gerondal Singapore, Ltd., all of Singapore, British Malaya: rubber.

Nai Vajra Nim Boonchaj, representing Nim Hong Chua & Co., 71 Sampeng St., Bangkok, Siam: rubber.

Madame Vve. Louis Chabert, 51 Rue Eugene Etienne, Phnom-Penh, Cambodge, French Indo-China: damar gum, gutta percha, lac gum, and sticklac.

Export Opportunities

Andre Bakouche, representing Société Algérienne de Tissus et Nouveautés, 16 Rue Caraman, Constantine, Algeria: tires.

Siegfried Goldberg, representing Handels- & Argenturfirma Akago, 12 Gjutargatan, Stockholm, Sweden: plastic products, rubber goods, textiles, machinery.

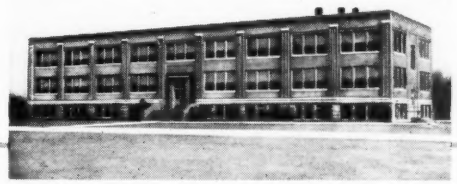
(Continued on page 718)

. . . a little goes a long way

Rubber manufacturers who use TITANOX know how economically it whitens and brightens their products. They know they're getting titanium dioxide pigments high in effectiveness for natural or synthetic stocks or for white or tinted items.

TITANOX pigments are consistently good-working, too. Their extremely fine particle size, ease of dispersion, and high refractive index make for greater brightening power. In colored rubber, TITANOX imparts an appealing clarity of tint.

Our Technical Service Department will be glad to help solve your pigmentation problems. Consult them through the nearest Titanium Pigment Corporation address.



Industry has profited by a host of basic advances in titanium pigment pioneered in research laboratories such as this one at Sayreville, New Jersey. Here highly experienced technicians experiment constantly to improve existing grades of TITANOX pigments and to develop new types.

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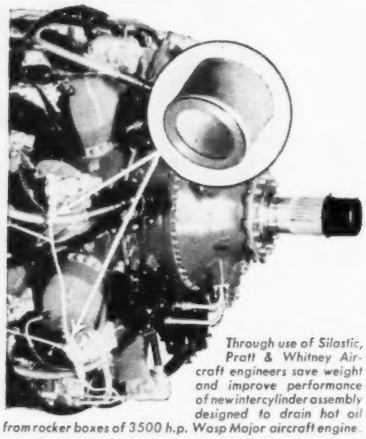
Silicone News

DC SILICONES



Through use of Silastic, Pratt & Whitney Aircraft engineers save weight and improve performance of new intercylinder assembly designed to drain hot oil from rocker boxes of 3500 h.p. Wasp Major aircraft engine.

SILASTIC* solves another aircraft problem

Pratt & Whitney Aircraft engineers had to design an intercylinder assembly to drain hot oil from the 30 rocker boxes on the underside of the 28-cylinder Wasp Major. They used metal tubing but between the tubing and the rocker boxes elastic connectors were necessary to absorb the relative motion between engine cylinders. The connectors had to stay elastic at temperatures up to 300° F. and in contact with hot oil.

This problem of elasticity at high temperatures has plagued design engineers for generations. Pratt & Whitney aircraft engineers, however, had already solved that problem once with heat-stable, oil-resistant gaskets of Silastic, used by The Connecticut Hard Rubber Company, to seal the 56 rocker boxes of the Wasp Major.

So, working again with engineers of The Connecticut Hard Rubber Company, New Haven, Conn., they designed a new type of intercylinder oil seal. It called for a metal tube sealed to the cylinder by a Silastic seal and spacer assembly. This design saved weight, heat was more easily dissipated through the all-metal exterior of the assembly, and performance standards were improved.

The Connecticut Hard Rubber Company also worked out production methods for obtaining adhesion between the metal and the Silastic 167 used in the body of the seal. Other Silastic stocks, serviceable over a temperature range of −70° to 350° F. continuously—up to 500° F. in intermittent use—are described in leaflet No. U21-1.

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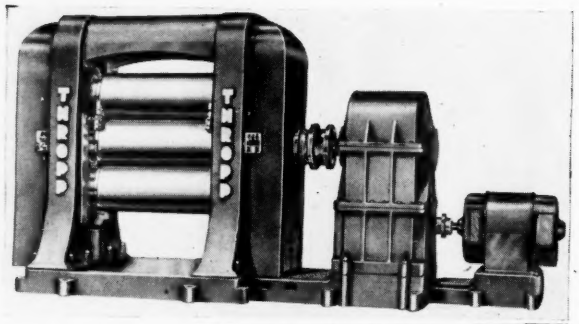
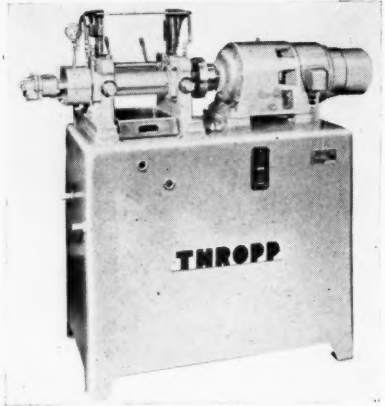
*Trade Mark Dow Corning Corporation

New Machines and Appliances



(Above)

Thropp High-Speed Calender with Roller Bearing Roll Necks



(Right)

Thropp Laboratory Mill with Roller Bearing Roll Necks

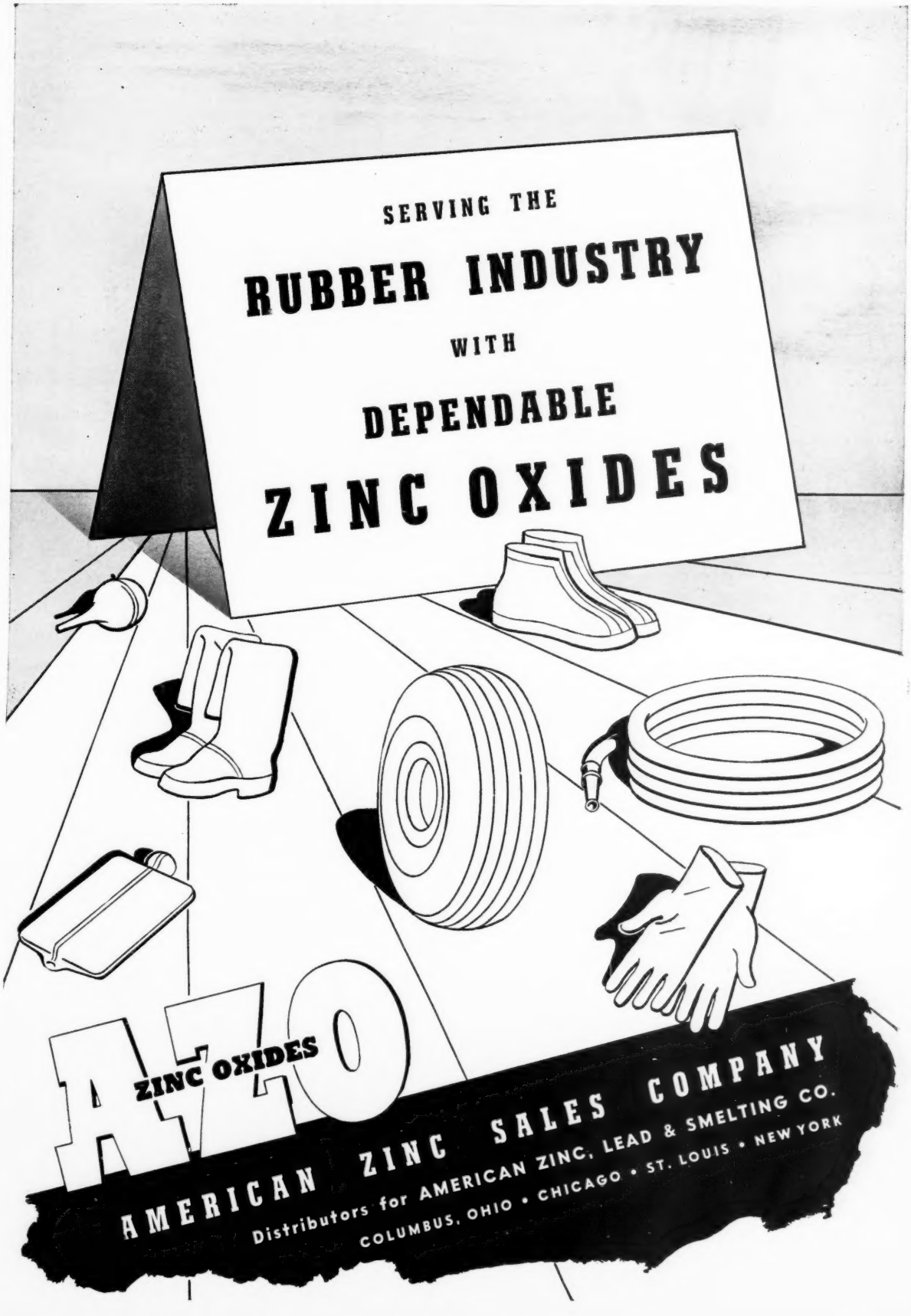
Roller-Bearing Mill Macinery

A NEW calender and a new laboratory mill have been developed by Wm. R. Thropp & Sons Co., E. State St., Trenton, N. J., which illustrate the application of roller bearings to rubber and plastics mill machinery.

The calender is of the 24- by 66-inch, three-roll, high-speed type. Important features of the unit include self-alining roller bearings on the roll necks, and vertical enclosed herringbone speed reducer driving direct to the middle roll, thus eliminating the master gear and pinion. The calender is equipped with a completely enclosed and self-contained lubrication system for the roll neck bearings, which will withstand exceptionally high temperatures, it is claimed, and has oil seals that give complete

"TRY MY FORMULA!" SAYS PHILBLACK O

FOR FURTHER DETAILS, SEE AD ON PAGE 582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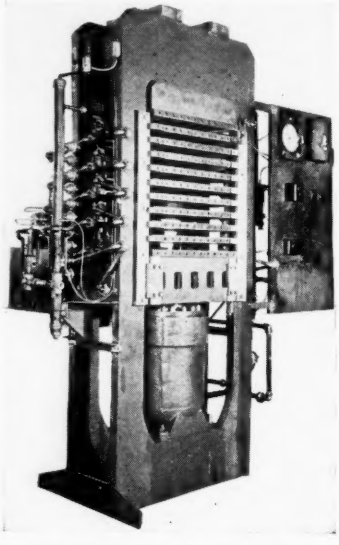
protection against oil leakage at very high roll operating temperatures.

The laboratory mill was designed to meet a chemical manufacturer's requirements for precision at high operating temperatures. It has self-alining roller bearings on the roll necks, permitting the use of exceptionally high roll surface temperatures. To provide simplicity, a direct drive to the fixed roll was arranged from a GE gear head motor through a flexible coupling. Lubrication of the roll neck bearings is accomplished by a completely enclosed circulating system, with leakage at the roll necks prevented by use of a mechanical type of oil seal. The guides are of the up-swing, easy cleaning type.

New Hydraulic Press

A NEW line of Eemco heavy-duty hydraulic presses has been introduced by Erie Engine & Mfg. Co., Erie, Pa. An interesting engineering feature of the presses is that the frames are fabricated from solid steel plate, thus eliminating the usual strain rods, and are designed to withstand the rated loading of the press with minimum deflection. This design completely eliminates the troubles caused by loosened strain rod nuts, and countersinking of the crossheads by strain rod shoulders.



Eemco Heavy-Duty Hydraulic Press

Cast-steel cylinders are used, together with semi-steel rams. A generous ram guide is provided to insure accurate platen travel, and cylinders are tapped for one or two large-size inlets and for an air bleeding cock. All glands are machined from solid steel plate with provision for collecting seepage. Chevron-type packing is employed and can be used with either oil or water. The ram head and crosshead are made from heavy solid steel slabs, and the crosshead is backed by cross-framing between the main frames to reduce deflection.

The standard platens are of the drilled and plugged type, with all edges machined. Intermediate platens are guided on the press frame. Multiple-opening presses are furnished with simple, but positive platen stops to provide accurate control of platen location. Presses may be furnished with platen circulation system either in parallel with manifolds or in series. Either swing joints or flexible tubing may be specified. Push back cylinders may be provided if desired, and pumping units for any desired pressure or speed of ram travel may be added.

Belt Handling Machine

ANYONE who has ever witnessed the work involved in cutting a length of wide, heavy belt from a stock roll can appreciate the possibilities of the new Beltmaster machine, developed by Ralphs-Pugh Co., 530 Howard St., San Francisco 5, Calif. The company, distributers of mining, conveyer, and cannery belting, developed the machine to solve its own strenuous and costly belt handling problems. The Beltmaster, it is claimed, enables one man alone, in minutes instead of hours, to handle up to a ton of belt through the eight operations required to get a large belt measured, cut, and ready for shipment.

The machine is portable, being mounted on casters with floor locks provided for steadiness during operation, and operates in a space of only 12 by 12 feet. Special features include adjustable brake to maintain tension and keep stock belting rolled tight; ratchet lift and geared lowering device, both of one-man capacity; adjustable belt guides to insure belt winding up true; geared cut-off knife and powerful holding clamp to cut the belt square and true, both as to width and edge; an accurate measuring device to give correct belt length; a collapsible core on which

(Continued on page 704)

THE STONE-AGE WAY

To— users of Mineral Rubber

You will find substantial savings in time and effort, and freedom from contamination by using our newly developed

FLAKED MINERAL RUBBER

By eliminating the present costly method of breaking the solids manually with an axe or sledge, manufacturers will enjoy a reduction in expense also. Acceptance by the industry of mineral rubber in this easy-to-process flaked form already has been impressive. Your trial order will be shipped immediately.

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Specifically designed, and of sturdy construction, for cutting cured and uncured rubber or rubber like materials.

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Reinke & Amende, Inc., 1925 East Olympic Blvd., Los Angeles, Cal.
Charles T. Wilson Company (Canada) Ltd., 406 Royal Bank Building, Toronto, Canada

EUROPE

GREAT BRITAIN

Papers Read at Latex Conference

The latex conference organized by the Manchester Section of the Institution of the Rubber Industry on May 5 and 6 was a most successful function which drew a large number of visitors including several leading personalities from France, Holland, India, and Australia. The actual conference took place on May 6 when 15 papers, divided into four groups, were presented.

Group I

"Characteristics of Clonal Budgraft Latex," by I. Kemp, chief chemist, Revertex, Ltd., revealed that continued research on clonal latex indicates ever more clearly that yield alone cannot be made the basis for selection in establishing new clones and that stability of latex is a factor that must be considered. Latex from a particular clone was found subnormal in stability to evaporation, and various other clones were therefore also examined to determine whether this was a common failing of clonal latices. Of nine clones examined it was found that only two were fully normal in their stability to evaporation, and six definitely subnormal in this respect.

"Factors Affecting the Stability of *Hevea* Latex," by F. J. Paton, covered the following points: (1) The stability of latex fresh from the tree depends on the clone, the district, the season, and the weather. (2) The increase in water-soluble acids may be considered a measure of the decomposition which occurs. (3) Numerous experiments fail to prove that proteins are responsible for varying properties of latex. (4) Centrifuged latex is more stable than creamed latex. Dr. Paton made special mention of the Malayan clone, Glenshiel I, whose consistent instability was found to be associated with absence of lipin.

"Spontaneous Coagulation of *Hevea* Latex," by G. E. van Gils, brought out the important fact that the root cause of spontaneous coagulation of latex is the formation of soaps from magnesium salts in the latex and fatty acids liberated by decomposition of latex constituents. The cause of the fatty acid formation leading to soap is not yet clear. Magnesium promotes spontaneous coagulation as indicated by the fact that if it is removed from the latex, the change is delayed. Again while freezing fresh latex causes coagulation (probably delayed spontaneous coagulation), coagulation does not follow if latex is freed from magnesium before freezing.

In the subsequent discussion E. W. Madge warned that ammoniated latex cannot be frozen with impunity. W. H. Stevens noted that soap is a well-known sensitizer. Dr. Altman suggested careful analysis during spontaneous coagulation might be very revealing with regard to formation of fatty acids.

"Quality of 1946 Latex Supplies," by H. C. Baker, Ceylon Rubber Research Scheme, summarized the variations in the properties of latex purchased by the British Government from the Far East during 1946. As an aid in following the paper, a table giving details of the analysis of concentrated and unconcentrated latices was passed out to the audience.

Group II

"Evaluation of Creaming Agents." W. S. Davey and K. C. Sekar. This paper, by W. S. Davey, formerly with the London Ceylon Research Scheme, was written in Malaya in 1941, just before he was killed in the Japanese fighting. It was read by his friend, Mr. Martin (chairman of the conference) as a tribute to his memory. Tests carried out on gum tragacanth, gum tragon, sodium alginate, and methyl cellulose attempted to determine the optimum amount required, that is the amount that will give a clear serum in four days. In general the optimum amount seems to depend largely on the viscosity of the creaming agent solution; however, in the case of the alginates, differences in viscosity had little effect on results. Some agents, as gum tragon and methyl cellulose, require boiling to give a good solution.

"Positex," by C. M. Blow, was a review of Dr. Blow's well-known work on the subject.

"Storage Stability of Latex Compounds," by C. Falconer Flint and H. Taylor, revealed that the difficulty caused by zinc oxide thickening of latex due to zinc ammonium ions can now easily be controlled by the addition to latex of a class of ethylene

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oxide condensation products referred to as non-ionogenic stabilizers, one of which is marketed as Vulcastab L W. These bodies operate almost exclusively by control of rubber particle hydration and do not materially affect the rate of cure, or are they influenced by positive ions in the mixings.

In the course of the discussion that followed, it emerged that the products were not really new, since the I. G. made a product sold as Emulphor O, understood to be a condensation product of ethylene oxide and a higher fatty alcohol, with similar technical effect to Vulcastab L W. It further developed that use of the new agent results in some loss of ease in processing; while water absorption of the rubber products might be somewhat increased.

Group III

"Gelling Phenomena," by E. W. Madge and D. W. Pounder, presented a detailed study of several features of the behavior of sodium silicofluoride as a gelling agent. It was pointed out that the theory of Twiss and Amphlett, who attribute the action to formation of hydrofluoric acid and so to zinc ions, fails to explain the promotion of gelling well on the alkaline side, even when zinc oxide is not present, that is from pH 9.15 to 8.15. The latex taken as booty in Malaya is very unstable and requires a much higher pH than 8.15. The effects of modifying agents were also discussed, as were the possibilities of controlling the equilibrium gelling state. During discussion, Mr. Wren suggested that the nature of the serum contained in the latex concentrate may play a vital part in the silicofluoride hydrolysis. The simple addition of fatty acid to the mixture will prolong gelling time from a few minutes to hours.

"Recent Developments in the Heat Sensitization of Latex," by S. D. Sutton, surveyed the BIOS 349 and CIOS 22 reports and more particularly the author's paper on the use of the I. G. product, "Igevin M50," for heat sensitization. This reagent, now known to be a polyvinylmethyl ether, was sold as a 50% solution and becomes insoluble in water at a temperature somewhat above 35° C. Although it was designed for use with synthetic latices, it has been possible to work out formulae permitting its incorporation also in natural latex.

"Molding of Rubber Goods from *Hevea* Latex," by A. Jarrijon, and **"Natural, Thermal and Biochemical Degradation of Ammoniated Latex,"** by F. Lepetit, both covered practically the same ground: the heat sensitivity of aged natural latices, after having been stored for six years in a glass, was still mechanically stable and compoundable, but easily sensitive to zinc oxide at about 70° C., yielding a uniformly shrinking gel useful for molding. A satisfactory method could be developed for obtaining the same properties by artificial aging of natural latex, which involved heating to 143° C. for two to three hours in an autoclave. Dr. Flint drew attention, in his summary of the second paper, to the fact that the heat-sensitizing agent must be contained in the aged serum, since it was possible to transfer this sensitivity to fresh latex by addition of aged serum.

Group IV

In **"Latex Sponge and Its Competitors,"** P. Schidrowitz reviewed various processes for latex sponge, including that patented by the author himself. Next modern competitors were considered, including polyvinyl acetate or polyvinyl alcohol sponge, Styrofoam from polystyrene, viscose sponge, linoleic sponge, and synthetic rubber sponges. Dr. Schidrowitz believes natural latex sponge will continue to have advantages over any other rubber variety.

In **"Latex Patents — The Situation Today,"** W. H. Stevens treated of latex patent trends in the period 1920-1937 as revealed by a study of 1975 abstracts issued by the British Rubber Development Board. These trends were graphically illustrated by a chart.

"Tendencies and Likely Future Developments of Latex Applications in the U. S. A.," by F. H. Cotton, Northern Polytechnic, considered chiefly synthetic latices. Mr. Cotton cited the advantages of synthetic latices in regard to price, and stability to traces of copper and manganese, and also pointed out that the small particle size was useful in impregnation. He quoted A. R. Kemp, of Bell Telephone Laboratories, as saying that the particle size in latex, as it comes from the tree, is much smaller than what is found later after agglomeration has occurred.

Dr. van Rossem questioned the claim for extremely small particles and agglomeration in fresh latex, to which Mr. Cotton replied that Lucas had obtained photo-micrographs which seemed to demonstrate particle growth. To a question on polyvinyl chloride latex, Mr. Cotton stated that there was reticence in the United States on this subject. Dr. Flint noted that GR-S latex may be prepared directly in concentrated form with large particles.

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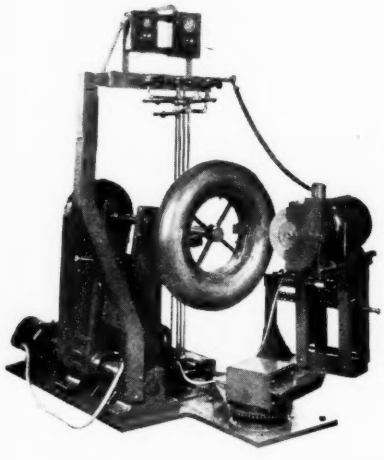

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"Some Unsolved Problems of Latex Science and Technology," by T. R. Dawson, Research Association of British Rubber Manufacturers, reviewed a number of fundamental questions regarding latex for which no satisfactory answers have yet been found. We do not yet know what latex really is, where it comes from, what its function is in the tree. Three conflicting theories exist regarding the general nature of the rubber particle in the latex, and as many self-contradictory theories for the chemical processes that result in creaming. There is a dearth of comparative data to show the relative merits of the hundreds of materials used in processing latex; there is no explanation or remedy yet for the unpleasant "handle" of latex rubber. In the discussion later on Mr. Dawson said his aim in presenting his paper had been not to condemn his colleagues, but to urge correction of the tendency to wander into fascinating by-paths and to keep close to fundamentals instead.

Problem of Carbon Black

The rubber industry here is much concerned about the shortage of carbon black and the matter has also been receiving the attention of the House of Commons. Recently, in answer to questions on the subject, the President of the Board of Trade, Sir Stafford Cripps, stated that the Inter-Departmental Committee on Carbon Black, which was appointed in April, 1946, to investigate possibility of finding sources of production and supply of carbon black outside the United States, has assembled much valuable information and has carried out a good deal of exploratory work and that plans are being explored for the production of carbon black in the United Kingdom. He also said that he had received confidential information from the Anglo-Iranian Oil Co., which he was not at liberty to disclose.

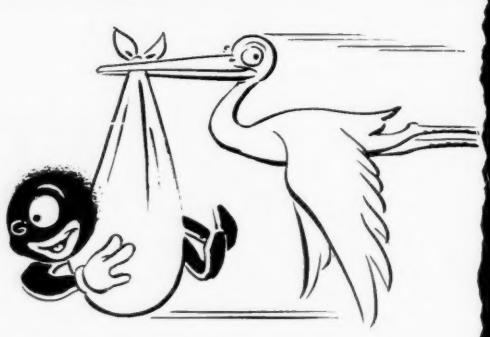
This reply apparently failed to satisfy a questioner who pointed out that last year England had spent $5,250,000 on carbon black in the United States, "while at the same time millions of cubic feet of natural gas are being blown into the air every day in the Middle East which could be burned to produce the carbon black we require." He intimated that he intended to raise the question again later on.

Dunlop Report

Despite many difficulties the Dunlop organization throughout the world on the whole made satisfactory progress in 1946 in converting from war to peace production, Sir J. G. Beharrel, chairman of the Dunlop Rubber Co., Ltd., said at the forty-eighth ordinary general meeting of the company.

Regarding Dunlop Plantations, he revealed that crop now exceeded the 1941 rate of production, and business in concentrated latex had been reestablished with shipments comparable to those of 1941 both as to quantity and quality. The mature areas of high-yielding buildings and clonal seedlings suffered comparatively little damage under the Japanese occupation and were now yielding at a rate far over 1,000 pounds per acre.

Turning to rubber manufactures, he reported that though tire output had been restricted by shortage of raw materials, the normal ranges of Dunlop tires were replacing the wartime ranges.



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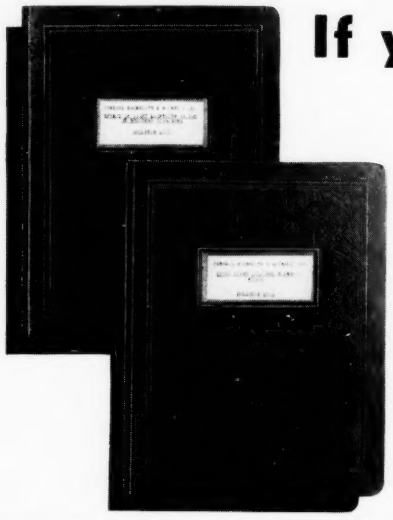
FOR FURTHER DETAILS, SEE AD ON PAGE 582



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If you process Neoprene, here are two bulletins which will be of interest to you. They contain technical data derived from tests in which magnesia products were involved. They are primarily concerned with Scorch Resistance, which is of special interest during the summer months.

Copies of these bulletins 47-1 and 47-2 will be gladly sent you on request. Please write on company letterhead.

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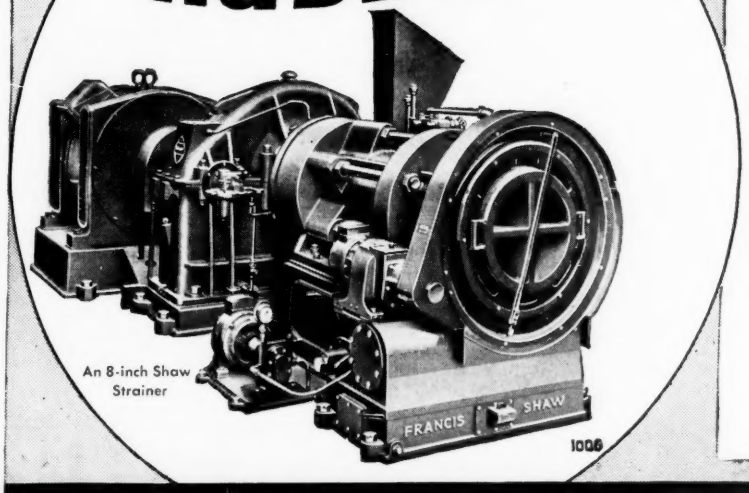

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Good progress was made in the aviation division. The Dunlop brake had proved so satisfactory that it was being fitted to every jet-propelled British aircraft. Export of Dunlop aviation equipment was started again, and prospects are encouraging. It was planned to provide service for aircraft with Dunlop aviation parts all over the world, and soon service stations would be operating at various aerial terminals.

The manufacture of Dunlopillo had to be started from scratch in 1946, but by the end of the year the volume was equal to that of 1938. Considerable expansion in sales of latex foam at home and abroad was planned. Progress was reported in the footwear, hose and tubing, and clothing divisions. The production and distribution of Dunlop-brand clothing was transferred to a subsidiary, Dunlop Clothing & Weatherproofs, Ltd., and a new subsidiary, Dunlop Sports Co., Ltd., was formed to handle the distribution of Dunlop sports goods. The new factory at Speke increased output in 1946, and further increase was expected in 1947, but shortages hampered the activities of the new subsidiary, Dunlop Special Products, Ltd.

Overseas, the Dunlop Tire & Rubber Corp. in the United States and Dunlop Tire & Rubber Goods Co., Ltd., in Canada reported an excellent year, as did the Indian and South African companies. Australian Dunlop converted satisfactorily; the Irish company had a difficult, but satisfactory year; the French company again made a profit, but the outlook for 1947 was obscure. Shortages hampered the erection of plant in New Zealand; the plants in Germany and Japan continued to operate under control of the Allied authorities.

All overseas export selling organizations were reestablished in 1946, some under difficult circumstances, and for the present only in skeleton form. In Western Europe, the Near and Middle East, and Africa, distribution arrangements could be strengthened.

British Industry Notes

Sir Frederick Bain was elected president of the Federation of British Industries early in May. He succeeds Sir Clive Baillieu, who held the office for two years.

Rediffusion, Ltd., has added to its radio heating devices a machine for welding seams prior to vulcanization. It was specially designed for plastics, but is just as useful for the manufacture of rubber goods. With the new machine, it is claimed, seams of uniform thickness can be welded in from one second to three seconds, and a total weld area of 1¼ square inches is possible. The machine is fully insulated where necessary to eliminate all danger from radio frequency burns and is so designed that all essential controls can be reached and the work readily adjusted from all sides, while the operator remains seated. An extra table is available to provide additional working surface to facilitate welding of larger pieces as aprons or raincoats.

Powell, Duffryn Products, Ltd., was recently registered with a capital of £500,000 in £1 shares, to produce carbon and materials containing carbon, to manufacture goods, substances and materials therefrom. The directors are: Edmund L. Hann (chairman and managing director of Powell, Duffryn, Ltd., and of other companies), H. M. Merrett (chairman of Cory Bros. & Co., Ltd., etc.), R. W. Foot (chairman, Powell, Duffryn Technical Services, Ltd., etc.), H. V. Vale (director of Powell, Duffryn, Ltd., etc.), and J. G. Bennett (director of Delenium, Ltd., etc.).

Commercial Plastics, Ltd., has just been formed to manufacture and deal in plastics, synthetic resins, chemicals, fibers, textiles, mineral oil and coal products, and their derivatives, plastic goods, etc. The company has a capital of £300,000, in 150,000 5% cumulative preference shares, and 150,000 ordinary shares of £1 each.

GERMANY

Tire and Tube Output in 1946

The report of the Military Governor of the United States zone in Germany on tire production shows steady gains for all types during the first three quarters of 1946. In the last quarter occurred some reduction as compared with the preceding quarter in the output of passenger-car tires and tubes, and

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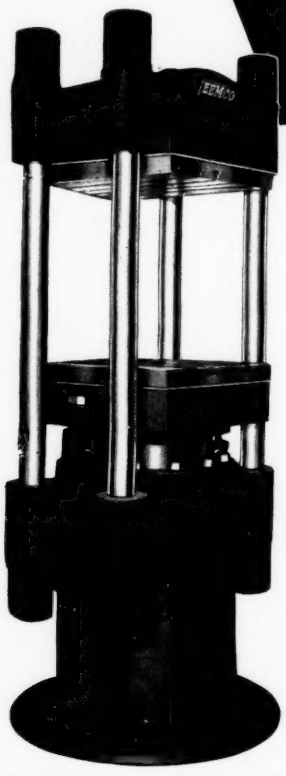

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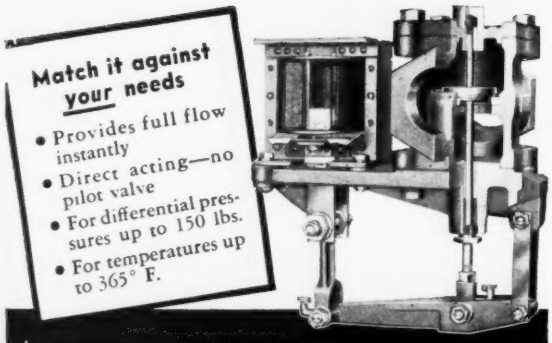
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New bulletin shows wide scope of the Johnson Solenoid Valve; ask for copy

The Johnson Corporation

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cycle casings. This apparently was due to the coal and power shortage in December, 1946, which caused one of the six tire plants in the United States zone to shut down completely during the month; while the other five closed beginning December 21.

The following table gives the average monthly production of tires and tubes in each quarter, and the total for the year:

	Monthly Average				Total
	1st Qr.	2nd Qr.	3rd Qr.	4th Qr.	for 1946
Passenger-car and truck casings *(units)*	18,834	21,210	26,944	29,899	275,661
Passenger-car and truck tubes *(units)*	13,474	22,004	23,340	22,664	244,446
Bicycle casings *(units)* ..	198,577	214,979	249,644	240,178	2,707,407
Bicycle tubes *(units)*	116,869	179,552	204,901	215,587	2,150,727
Production index—rubber and asbestos manufactures (1936=100)	21	30	37	40	

Dunlop Factory at Hanau

The Dunlop tire factory on the outskirts of Hanau is the third largest in Germany today. The plant, which suffered 45% destruction by Allied bombings during the war, is badly handicapped by shortages both of manpower and equipment and, with 1,500 workers instead of the normal 5,000, is able to work at only 40% of total capacity. Present production is about 21,000 automobile tires monthly and approximately 3,000 cycle tires daily. Tires are made with 50% Buna and 50% natural rubber supplied by Malaya via the port of Hamburg. While there is a shortage of materials such as carbon black and zinc oxide, the management is hopeful that the easing of interzonal transportation and communication will bring relief here. Increased supplies of compounding ingredients will become imperative if the monthly output of tires is to be stepped up to 50,000 units, as it is hoped to be able to do when a new Buna and compounding section now under construction is completed.

It is learned that the Dunlop company has contracted through the Joint Export-Import Agency at Minden to deliver 22,000 tires to Sweden by August; about 5,000 tires have already been shipped.

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Scientific Research and Production Control Equipment

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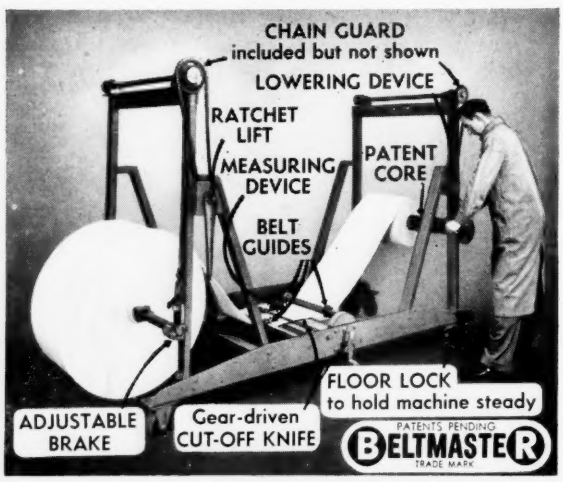
(*Continued from page* 694)

the belt is wound, which reduces to a smaller size to permit easy removal when belt is ready for shipment; and chain guards to protect the operator. The standard Beltmaster handles belts up to 30 inches wide and 2,000 pounds in weight, with larger capacity machines built on special order. An attachment for slitting slab belt stocks is also available for any Beltmaster.



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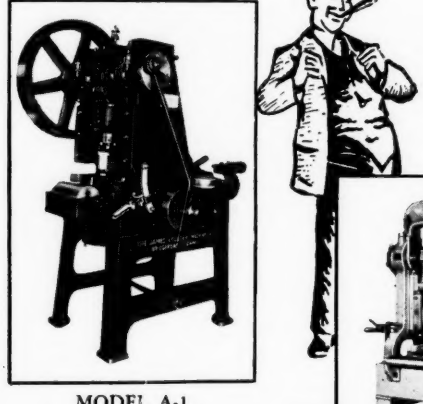
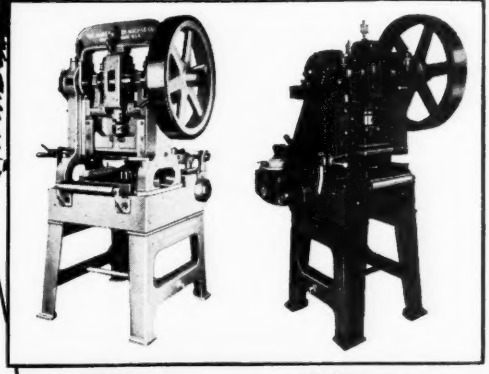


MODEL A-1



MODEL A-2 MODEL A-3

- Model A-1 For HEELS at high speed production, or short runs.
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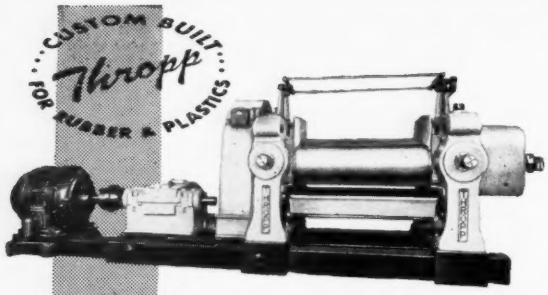

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Editor's Book Table

BOOK REVIEWS

"Annual Report on the Progress of Rubber Technology." Volume IX, 1945. Edited by T. J. Drakeley. Institution of the Rubber Industry, 12 Whitehall, London, S.W.1, England. Paper, 9¾ by 7¼ inches. 122 pages. Price, 4/6 to members, 12/6 to non-members.

As in preceding volumes of this series, this latest report covers developments in rubber production, technology, and manufacture during 1945 by means of 23 short articles written by leaders in their respective fields. Extensive bibliographies are appended to each article covering 1945 papers and patents, with occasional references made to work published in 1944 and 1946. Comprehensive name and subject indices complete the volume.

Articles and their authors are as follows: "Historical and Statistical Review" by T. D. Dawson and C. J. Redfern; "Planting and Production of Raw Rubber, Latex, Gutta Percha, Balata, Chicle and Jelutong" by T. R. Dawson; "Properties, Applications and Utilization of Latex" by C. F. Flint; "The Chemistry and Physics of Raw Rubber and Rubber Derivatives, Gutta-Percha, Balata, Chicle and Jelutong" by B. J. Habgood; "Synthetic Rubber" by W. J. S. Naunton; "Testing Equipment and Specifications Other Than for Latex," J. M. Buist; "Compounding Ingredients, Accelerators, Antioxidants and Softeners," E. J. May; "Fibers and Textiles," W. Knight; "Chemical and Physical Properties of Vulcanized Rubber," G. Gee; "Tires" by G. A. Shires and A. E. Whitehead; "Belting," W. Bowden; "Hose and Tubing," J Kirkwood; "Cables and Electrical Insulation," H. A. Daynes; "Footwear," R. C. Davies; "Mechanical Rubber Goods," R. W. Parris; "Games and Sports Accessories," J. G. Anderson; "Rubber Flooring," J. Kirkwood; "Surgical Goods," C. R. Pinnell; "Textile-Rubber Composites, Solvents and Cements," W. N. Lister; "Cellular Rubber," W. D. Guppy; "Hard Rubber," B. L. Davies; "Works Processes and Materials, Including the Treatment of Raw Rubber in the Factory and the Treatment of Vulcanized Rubber," E. V. Bratby; and "Machinery and Appliances" by F. M. Panzetta.

"Concise Chemical and Technical Dictionary." Edited by H. Bennett. Chemical Publishing Co., Inc., 26 Court St., Brooklyn 2, N. Y. Cloth, 6 by 9 inches, 1090 pages. Price, $10.

Some 50,000 definitions are included in this volume which covers every field of scientific and technical development. The book contains many thousands of chemical, physical, metallurgical, mineralogical, biological, medical, pharmaceutical, mathematical, and botanical terms, and descriptions of many manufacturing processes, machinery, raw materials, and finished products; it also gives terms used in mechanical, electrical, radio and television engineering, welding and other shop practices; and descriptions of terms gathered by Allied commissions in Germany and other occupied countries are included.

For chemical compounds, the following data are generally given: chemical name and synonyms; semi-structural formula; molecular weight; color, form, and other physical properties; specific gravity; melting and boiling points; solubilities; and uses. A special feature of the dictionary is the inclusion of thousands of trade-name products in the rubber, plastics, paint, and other industries, giving their composition, properties and uses. Also included are addenda sheets which list the newest trade names and definitions of additional technical terms. Other features of the volume are sections on nomenclature of chemical terms, pronunciation of chemical words, names and formulae of chemical radicals, organic ring systems, and many useful reference tables on chemical indicators, conversion of temperature and other units, technical symbols, chemical elements and their discoverers, and vitamin values of foods.

"Plastics Business." Herbert R. Simonds and Joseph V. Sherman. D. Van Nostrand Co., Inc., 250 Fourth Ave., New York 16, N. Y. Cloth, 8½ by 5½ inches. 446 pages. Price, $5.

As the name indicates, this book deals primarily with the business and statistical aspects of the rapidly expanding plastics industry. The volume describes in detail the operations of most companies in this field, both resin manufacturers and fabricators of finished products, explaining what each group does, the capital invested, the size of the average plant, and all related information on statistical, financial, commercial and economic as-

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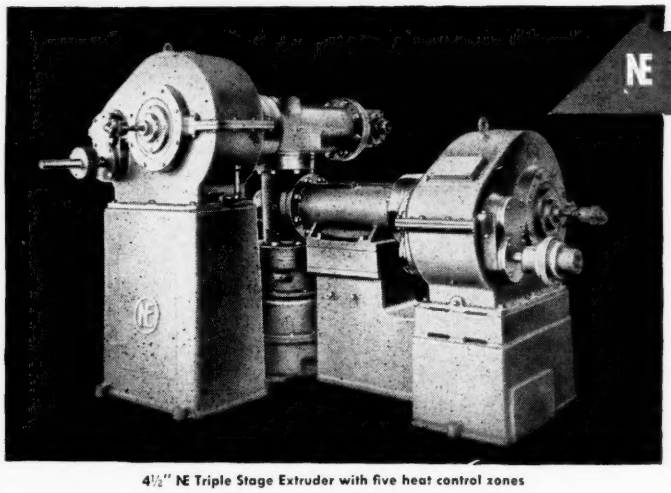

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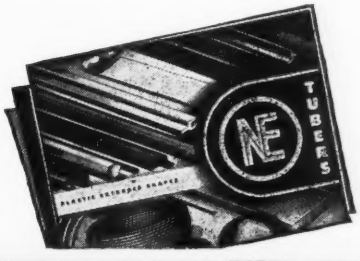

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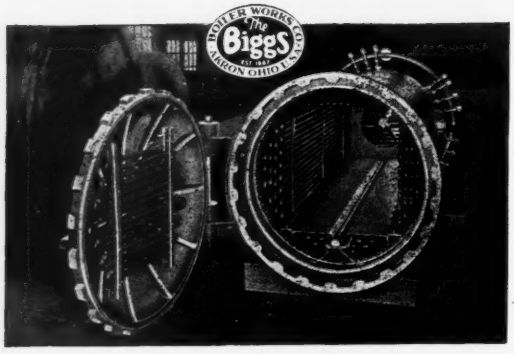

Fig. 47. Biggs vulcanizer with special heating manifolds and circulating fan; all sizes, various working pressures.

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Individual chapters are devoted to a description of the industry; characteristics of materials; organization of the industry; companies' statistics; growth of the plastics industry; sales and profits in plastics; prices of plastics; consuming plastics; the future of plastics; the inventor and the technician; foreign markets for plastics; effects on other industries; plywood; and synthetic rubber. The chapter on synthetic rubber discusses the interrelation between the rubber and the plastics industries, briefly reviews the government rubber program and its future prospects, and lists the government polymer and copolymer plants with their operators and locations. The final chapter presents a comprehensive list of plastics trade names with their types and manufacturers. A list of tables and an adequate index complete the book.

NEW PUBLICATIONS

"Continex FF." Technical Service Report R-4, July 7, 1947. Witco Chemical Co., 295 Madison Ave., New York 17, N. Y. 6 pages. Extensive test data are presented on the use of Continex FF, a fine furnace black, and other carbon blacks in natural rubber and GR-S. The data show the furnace black to give good tensile and tear properties, excellent rebound properties, excellent resistance to heat generation, and abrasive wear closely approaching that of channel black.

"Solvesso Story." Esso Marketers, New York, N. Y. 12 pages. This booklet describes four Solvesso products, essentially pure aromatic solvents made chemically from petroleum. The production of these solvents, their properties, and their use in solvent blends are described, and many charts and tables of properties appear.

"The Aristocrat of Floors." Rubber Manufacturers Association, Inc., 444 Madison Ave., New York, N. Y. 30 pages. The applications and advantages of rubber flooring are presented in this booklet by means of informal drawings and a running commentary. Information also appears on how to go about getting a rubber floor, together with a list of manufacturers.

"If It's Worth Shipping, It's Worth Packaging Right!" Union Pacific Railroad Co., 1416 Dodge St., Omaha 2, Neb. 4 pages. This folder, intended for display in shipping departments, illustrates and explains the correct and incorrect ways to construct crate frames, box corners, wooden boxes, and corrugated or solid fiber cartons in order to insure safe shipments of products by railroad freight.

"Highly Loaded Silene EF Stocks." Columbia Pigments Data Sheet No. 47-5. Columbia Chemical Division, Pittsburgh Plate Glass Co., Pittsburgh 13, Pa. 16 pages. Laboratory data in the form of charts and tables compare the effectiveness of different softeners in GR-S stocks containing high loadings of Silene EF. Wilmac DX is found to give a permanent softening which carries through the cure, while the other softeners tested were found unsatisfactory for these loaded stocks.

"Unicel ND, Non-Discoloring Blowing Agent for Rubber Sponge." L. S. Bake. Report No. 47-3, dated May, 1947. E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del. 4 pages. Information appears on the use of Unicel ND as a blowing agent to produce sponge having small, uniform cells. The material can be used in all types of sponge compositions and will not cause staining of surfaces in contact with the sponge.

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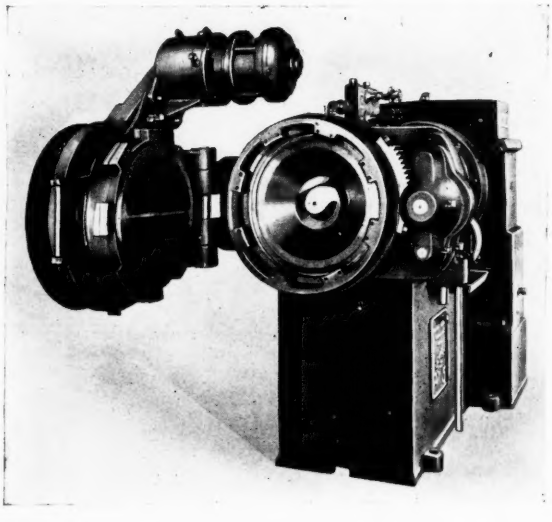

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"The Link-Belt Multi-Louvre Drier." Book No. 2209. Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. 12 pages. The company's new multi-louvre drier is illustrated and described herein. Engineering details appear together with typical layouts and dimensions and discussions of its use for drying, cooling, processing, and dust collection.

"The Improved Pyro Surface Pyrometer." Catalog #160. Pyrometer Instrument Co., 103 Lafayette St., New York 13, N. Y. 4 pages. This bulletin describes a new pyrometer designed to meet production and laboratory requirements for accuracy and ease of operation. Information is presented on the features of the pyrometer, types and applications of various surface thermocouples, and special-purpose surface models.

"Aminox in Natural Rubber Passenger Inner Tubes (Non-Black)." Compounding Research Report No. 3. Naugatuck Chemical Division of United States Rubber Co., Rockefeller Center, New York 20, N. Y. 8 pages. Chemical, physical, and compounding properties of Aminox are given, and laboratory data are presented showing the material to be an effective antioxidant for natural rubber passenger tubes.

"Adhesive Facts." B. B. Chemical Co., 784 Memorial Dr., Cambridge, Mass. 4 pages. This illustrated booklet gives typical materials bonded by the company's Bostik adhesives, examples of products now being made with Bostik, and types of adhesives in the company's line. A chart shows some of the Bostik adhesives, their types, the industrial application, and the materials being bonded therein. In addition, there are photographs of the company's laboratories and processing departments.

"Meeting the Special Problems of Small Business." Committee for Economic Development, 285 Madison Ave., New York 17, N. Y. 61 pages. This is a statement on national policy describing a program designed to strengthen small business in its management, finance, tax relations, and competitive opportunity.

"Rubber Tires and Inner Tubes." Industrial Reference Service, Office of Domestic Commerce, United States Department of Commerce, Washington, D. C. Part 12, Commodity Reference Series. Vol. 5, Part 12, No. 10, June, 1947. 8 pages. Price, 5¢. This is a factual survey of the growth of the rubber tire and tube industry, illustrated with many statistical tables and charts. After a brief history of the rubber industry and the inception of pneumatic tires, sections follow on automobile tire production, war production of tires, and a survey of the rubber used on tires during the period 1944-46.

"Buna N Synthetic Rubbers with 'Thiokol' Type FA." Technical Service Bulletin #101. Thiokol Corp., Trenton 7, N. J. 2 pages. A discussion of the use of "Thiokol" Type FA in Buna N stocks is given, together with information on typical formulations, their processing, and physical properties obtained with different curing cycles.

"Midco in Two Passenger Tire Carcass Compounds." Report No. 7. May 20, 1947. Midwest Rubber Reclaiming Co., East St. Louis, Ill. 4 pages. Extensive test data are presented evaluating Midco, a whole tire reclaim based on blends of natural and synthetic rubber, and comparing it with M-68, a standard whole tire natural rubber reclaim.

Production Series publications of the American Management Association, 330 W. 42nd St., New York 18, N. Y. **"Management Techniques for Increasing Labor Productivity."** No. 163. 51 pages. Price 75¢. **"Quality and Expense Control."** No. 164. 24 pages. Price 50¢. **"Getting and Using Employes' Ideas."** No. 165. 31 pages. Price 50¢. **"The Foreman—the Job and the Man."** No. 166. 31 pages. Price 50¢. **"Human Relations Opportunities for Management."** No. 167. 34 pages. Price 50¢. **"Cutting Tomorrow's Costs."** No. 168. 55 pages. Price $1. **"Production Policies for Increased Output."** No. 169. 36 pages. Price 75¢. **"The Human Aspects of Methods Improvement."** No. 170. 50 pages. Price $1. **"Departmental Cooperation in Cost Reduction."** Financial Management Series No. 85. 26 pages. Price 50¢. **"Motor Truck Facts."** 1947 Edition. Automobile Manufacturers Association. Detroit, Mich. 56 pages. **"Aloyco Stainless Steel Valves and Fittings."** Catalog No. 47. Alloy Steel Products Co., Inc., Linden, N. J. 54 pages.

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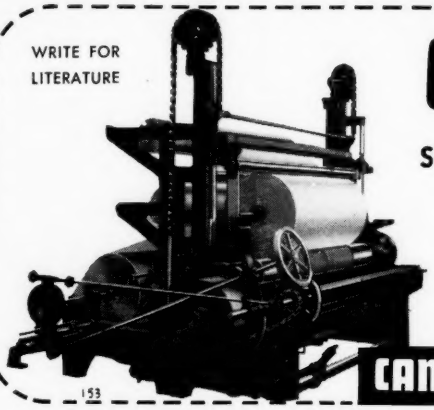

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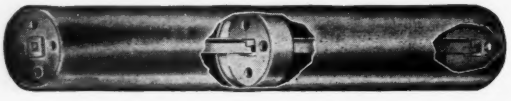

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• WILD RUBBERS • GUAYULE • NEOPRENE • BUTYL RUBBER • VISTANEX •

Market Reviews

CRUDE RUBBER

Commodity Exchange

WEEK END CLOSING PRICES

	May	June	July	July	July	July
1947	31	28	5	12	19	26
Sept.	15.80	13.80	14.65	14.40	15.90	15.65
Oct.	15.77	13.83	14.67	14.40	15.85	15.60
Nov.	15.73	13.87	14.75	14.40	15.80	15.50
Dec.	15.70	13.90	14.75	14.40	15.79	15.50
1948						
Jan.	15.65	13.93	14.80	14.40	15.75	15.50
Feb.	15.60	13.97	14.83	14.40	15.75	15.50
Mar.	15.55	14.00	14.85	14.40	15.75	15.50
Apr.	15.47	14.03	14.90	14.40	15.75	15.50
May	15.40	14.05	14.95	14.40	15.75	15.40
June	15.35	14.10	14.98	14.40	15.75	15.40
July	15.30	14.15	15.00	14.40	15.75	15.40
Aug.	15.25	14.15	15.02	14.40	15.75	15.40
Sept.	....	14.15	15.05	14.40	15.75	15.40

CRUDE rubber futures prices during July staged a modest recovery from the low June levels. During the first two weeks, prices fluctuated between the 14 and 15¢ levels, moving upward very slowly. Factors influencing this advance were the continued expectations of further liberalization of usage controls, the sharp drop in Malayan shipments during June, and the stronger tone of the London and Singapore markets. The commencement of hostilities in Java between the Dutch and the Indonesians, with the resultant prospect of sharply reduced shipments of rubber from Netherlands India, was quickly reflected in the world's rubber markets on July 21. In the New York Commodity Exchange, futures prices rose sharply and closed at the monthly peak. September delivery was quoted at 17.25¢, October at 17.10¢, November at 17.00¢, and December through September, 1948, at 16.90¢.

Despite the stronger technical position created by the continuing hostilities in the Indies, rubber prices later in the month slid downward in a cautious market. Contributing factors were the statement by Ernest Bevin promising action toward quickly terminating the warfare, and the apparent strength of Dutch forces which was expected quickly to overcome Indonesian military efforts.

The crude rubber market situation continues to cause much concern in Malaya and elsewhere in the Far East. The present price levels have occasioned a good deal of hardship in view of rises in cost-of-living commodity prices. This condition is reflected by decreased shipments of rubber and, in particular, the sharp reductions in native rubber production. Prices are such as to enable only the most efficient plantations to cover their costs and leave no funds for rehabilitation. This situation is quite serious in view of the fact that the full extent of the damage suffered by European plantations in Malaya during the Japanese occupation is only now being fully assessed. In addition, the rehabilitation work already begun in anticipation of a steady rubber market is now being made at a loss, and its future status is highly uncertain. Some reports indicate that retrenchment is already taking place. The recommendation of the Paris Rubber Study Group that the governments concerned should consider what action they are in a position to take to meet this downward trend in rubber prices should have some of its intended bolstering effect on the market.

WEEK-END CLOSING PRICES

	May	June	July	July	July	July
No. 1 Ribbed Smoked Sheets	31	28	5	12	19	26
July	16.50	14.00	14.50	14.50	15.88	15.75
Aug.	16.50	14.00	14.50	14.50	15.88	15.75
Sept.	16.25	14.00	14.50	14.50	15.88	15.75
Oct.	....	....	14.50	14.50	15.88	15.75
No. 3 Ribbed Smoked Sheets	....	....	....	....	13.88	16.63 15.50
No. 2 Brown	14.50	11.75	12.25	12.38	13.63	13.88
No. 3 Amber	14.50	11.75	12.25	....	....	....
Flat Bark	13.25	11.00	11.00	11.50	12.25	12.25

New York Outside Market

MARKET conditions on the New York Outside Rubber Market closely paralleled those of the Commodity Exchange. Spot prices hovered in the 14 to 15¢ price range for the first part of the month and rose sharply on July 21 to a peak of 17.25¢ for No. 1 ribbed smoked sheets. No. 3 sheets were quoted at 16.63¢; while No. 2 brown sold at 15¢, and flat bark was priced at 13.50¢ a pound. The market was relatively steady throughout, and a moderate but fairly consistent factory demand made itself felt, with some interest being displayed in the lower rubber grades.

RECLAIMED RUBBER

THE reclaimed rubber market in July continued to reflect the decrease in demand which became apparent during June. This reduction in demand can be attributed to reduced tire production, the increased manufacture of white sidewall tires, and the normal vacation and inventory shutdowns in the rubber industry. Despite this reduced demand, reclaimed rubber market conditions are still favorable, and production is continuing at high levels. With rubber industry production expected to pick up in August, demand for reclaimed rubber is sure to show a corresponding improvement, it is believed by the trade.

Final April and preliminary May statistics on the reclaim industry are now available. Production in April totaled 26,696 long tons; consumption was 25,066 long tons; exports, 1,073 long tons; and end-of-month stocks, 33,527 long tons, including an inventory adjustment of 1,030 long tons. Preliminary May figures show a production of 25,392 long tons; consumption, 21,697 long tons; exports, 1,271 long tons, and end-of-month stocks of 37,223 long tons, including an inventory adjustment of 1,272 long tons.

There were no changes in prices of reclaimed rubbers made during the month.

Reclaimed Rubber Prices

	Sp. Gr.	¢ per Lb.
Whole tire	1.18-1.20	8 / 8.5
Peel	1.18-1.20	9 / 9.5
Inner tube		
Black	1.20-1.22	12.75/13.25
Red	1.20-1.22	13.5 /14
GR-S	1.18-1.20	9.5 /10
Butyl	1.16-1.18	8.5 / 9
Shoe	1.50-1.52	8.25/ 8.75

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.

Fixed Government Prices*

	Price per Pound
Guayule	
Guayule *(carload lots)*	$0.17½
Latex	
Normal *(tank car lots)*	.30¾
Centrifuged *(tank car lots)*	.32½
Plantation Grades	
No. 1X Rubber Smoked Sheets	.23
1X Thick Pale Latex Crepe	.29
1 Thick Pale Latex Crepe	.29
2 Thick Pale Latex Crepe	.28½
3 Thick Pale Latex Crepe	.28¼
1X Thin Pale Latex Crepe	.29
1 Thin Pale Latex Crepe	.29
2 Thin Pale Latex Crepe	.28½
3 Thin Pale Latex Crepe	.28¼
Liberian A	.28⅝
AA	.29
RCMA Watermarked Crepe No. 16	.32⅞
17	.32⅜
18	.30⅞
Sole Crepe Trimmings	.28½
No. 1X Thin Pale Latex Crepe Trimmings	.28½
1X Brown Crepe	.21⅞
2X Brown Crepe	.21⅝
2 Remilled Blankets (Amber)	.21¾
3 Remilled Blankets (Amber)	.21⅝
Rolled Brown	.185
Synthetic Rubber	
GR-M (Neoprene GN)	.27½
GR-S (Buna S)	.18½
GR-I (Butyl)	.18½
Wild Rubber	
Upriver Coarse (crude)	.12⅝
(Washed and dried)	.20½
Islands Fine (crude)	.14⅝
(Washed and dried)	.22½
Caucho Ball (crude)	.11⅝
(Washed and dried)	.19½
Mangabiera (crude)	.08½
(Washed and dried)	.18

* For a complete list of all grades of all rubbers see rubber Reserve Co. General Sales and Distribution Circular, July 1, 1945, as amended.

SCRAP RUBBER

SCRAP rubber prices declined drastically during July, with tires and tubes showing the greatest losses. Mixed auto tires went from $17.50 per net ton to $10 in the East, and from $17 down to $12 in Akron. S.A.G. passenger tires (natural) dropped from $17.50 and $18 per ton in the East and in Akron, respectively, to a low level of $13.50; while S.A.G. truck tires dropped from $15.50 and $16, respectively, to a price of $12.50. Some dealers admitted, however, that a buyer could obtain still further reductions in tire prices if substantial tonnages were purchased.

The tube situation is just as weak as the tire's. Mixed auto tubes, delivered Akron, dropped 5⅛¢ to a price of 3¢ per pound. Black passenger tubes fell from 6.25¢ per pound to 4¢; while black truck tubes dropped from 6¢ per pound to 3.75¢. Quotations for mixed puncture-proof tubes were nominal. The little business in peelings still taking place is at unchanged prices, but there is no demand for synthetic or recap peelings.

What with many reclaimers shut down for vacations, the scrap market was even duller during July than in preceding months, if possible. The foreign market is extremely spotty, and only small lots are being shipped. Most trade observers do not look for an increase in activity in the domestic market until fall, at the very earliest.

Following are dealers' buying prices for scrap rubber, in carload lots, delivered points indicated:

CHARLES E. WOOD, Inc.
120 Wall St. New York 5, N. Y.

Telephone—HAnover 2-0122

****

CRUDE and SYNTHETIC RUBBER

****

BALATA COQUIRANA
SORVA MASSARANDUBA
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ATGLEN, PA.

Regular and Special Constructions of
COTTON FABRICS

Single Filling Double Filling
and
ARMY
Ducks

HOSE and BELTING
Ducks

Drills

Selected
Osnaburgs

Curran & Barry
320 BROADWAY
NEW YORK

	Eastern Points	Akron, O.
	(Net per Ton)	
Mixed auto tires	$10.00	$12.00
Truck and bus tires	nom.	nom.
Beadless tires	nom.	nom.
S.A.G. passenger (natural)	13.50	13.50
(Synthetic)	nom.	nom.
Truck (natural)	12.50	12.50
(Synthetic)	nom.	nom.
No. 1 peelings (natural)	42.50	42.50
(Synthetic)	nom.	nom.
(Recap.)	nom.	nom.
No. 2 peelings (natural)	27.50	27.50
(Synthetic)	nom.	nom.
(Recap.)	nom.	nom.
No. 3 peelings (natural)	25.00	25.00
(Synthetic)	nom.	nom.
	(¢ per Lb.)	
Mixed auto tubes	nom.	3.0
Red passenger tubes	nom.	nom.
Black passenger tubes	4.0	4.0
Truck tubes	3.75	3.75
Mixed puncture-proof tubes	nom.	nom.
Air brake hose	nom.	nom.
Rubber boots and shoes	nom.	nom.

COTTON AND FABRICS

New York Cotton Exchange
Week-End Closing Prices

	May 31	June 28	July 5	July 12	July 19	July 26
Futures						
Aug.	32.82	35.95	35.53	37.71	38.08	37.92
Oct.	30.06	32.76	32.17	34.33	34.71	34.56
Dec.	29.21	31.69	31.13	33.50	34.23	33.95
1948						
Feb.	28.73	31.23	30.60	33.08	33.87	33.55
Apr.	28.49	30.99	30.27	32.93	33.77	33.39
June	27.86	30.26	29.55	32.26	33.17	32.76

THE July Cotton market, after a slow start, skyrocketed on government reports of low cotton acreage, broke on a wave of liquidation, and closed the month in a thin and nervous condition. The 15/16-inch middling spot price began the month at 37.75¢ per pound, rose to a seasonal high of 40.18¢ on July 16, then dropped back to close at 36.28¢ on July 31. Prices for October futures paralleled the movement of the spot market, starting at 32.44¢ per pound on July 1, rising to a peak of 35.30¢ on July 16, and ending the month at 33.96¢.

On July 8 the Department of Agriculture estimated that 21,389,000 acres of cotton were in cultivation on July 1, indicating the shortest supply of the staple in 24 years. This report, together with the already tight statistical position of cotton and reports of heavy weevil infestation in the cotton belt, brought about a sharp price advance that was based on excessive speculation. The price rises were halted by a wave of liquidation from commission houses and southern traders, with further price depression resulting from the news that the Geneva Trade Conference had rejected proposals for American-type agricultural export subsidies.

The market was extremely thin and sensitive toward the end of July. Some sources believed that an end to the light, one-sided market was in sight and would be finished off by movement of the new crop. Wide price movements are still in the offing until the probable size of this year's crop is known. When the crop estimates are in, it is believed that mills will start buying once more.

The New York Cotton Exchange estimated total consumption of all cotton in the United States during June at 755,000 bales, compared with 828,000 in May. This figure brought the total consumption for the first 11 months of the 1946-47 season to 9,385,000 bales, as compared with 8,434,000 bales for the corresponding period of the 1945-46 season. The Department of Agriculture indicated that carry-over on August 1 would run about 2,600,000 bales. Consumption and exports for the 1946-47 season were expected to total about 13,400,000 bales.

Fabrics

After a slow start a good business in wide and heavy industrial goods was conducted during the latter part of July. The largest volume of sales covered August and September deliveries, although certain heavy and wide ducks were contracted for delivery in December. Price increases of 2¢ a yard in wide sateens, broken twills, drills, and enameling ducks made during the month were later offset by reductions that tended to level off the abruptness of the rise. Virtually all other mill sales were made at unchanged prices, many of which were at former OPA ceiling levels.

Most trades, including the coating, rubber, automotive, and electrical industries, have indicated need of goods in the fourth quarter. The rubber industry was steadily reducing fabric inventories, but in certain instances this reduction was being accomplished by resales from stock rather than by consumption in rubber plants. Some second-hand sales of sheetings by rubber companies were also reported; the goods were turned over to other industries. The coating trade was exhibiting interest only in fill-in purchases.

RAYON

DOMESTIC rayon shipments in June were 11% below May figures, primarily as a result of a strike in a plant of the largest acetate rayon producer. Domestic filament yarn shipments during June totaled 53,800,000 pounds, a decrease of 10% from May, while viscose-cupra yarn shipments declined by 3%. For the first six months of 1947, both the acetate and viscose-cupra yarn shipments were 7% above those in the same period last year. Total yarn stock showed no change from May to June.

June domestic rayon staple shipments at 15,400,000 pounds were 16% below those of May and consisted of 12,300,000 pounds of viscose and 3,100,000 pounds of acetate staple. Cumulative shipments of domestic staple for the first half of 1947 were 11% above those of 1946. Viscose staple shipments in the first six months were up 9% over 1946 levels, while acetate staple deliveries increased by 17%.

During the initial half of 1947, an estimated 23,500,000 pounds of imported staple were received. Adding these imports to the domestic figure gives a total rayon staple availability from January through June of approximately 121,800,000 pounds, a figure 20% above the same 1946 totals.

Compounding Ingredients—Price Changes and Additions

Age Rite Dispersions	lb.	$0.60 / $2.25
Carey Extra Light Calcined Magnesia	lb.	.28
Dibutyl phthalate	lb.	.325 / .375
Diethyl phthalate	lb.	.305 / .3625
Dimethyl phthalate	lb.	.23 / .28
DPG (Diphenylguanidine)	lb.	.39 / .45
Ethyl Thiurad	lb.	1.25
Tricresyl phosphate	lb.	.3225/ .38
Neo-Fat H.F.O.	lb.	.21 / .22
1-60	lb.	.20 / .21
1.65	lb.	.24 / .25
P-33	lb.	$0.05
Rayox LW	lb.	.165 / $0.175
R-110	lb.	.185 / .195
Rotax	lb.	.39 / .42
Santicizer B-16	lb.	.52 / .57
E-15	lb.	.49 / .54
M-17	lb.	.46 / .51
No. 140	lb.	.3225/ .38
Telloy	lb.	2.00
Thermax	lb.	.03
Vandex	lb.	2.00

Rims Approved and Branded by The Tire & Rim Association, Inc.

15" & 16" D. C. Passenger	June, 1947
15x4.00E	20,097
16x4.00E	441,204
16x4.25E	328
15x4.50E	28,842
16x4.50E	312,121
15x5.00E	211,309
16x5.00E	7,163
16x5.00F	7,858
15x5.50F	91,051
16x5.50F	12,061
16x6.00F	3,901
16x4.00E—Hump	214,361
16x4.25E—Hump	2,087
15x4.50E—Hump	36,194
16x4.50E—Hump	19,346
15x5.00F—Hump	14,548
15x5-K	53,423
16x5-K	111,460
15x5½-K	12,046
15x6-L	30,758
16x6-L	89,803
15x6½-L	38,887
Truck	
17x3.75P	1,176
20x3.75P	2,557
17x4.33R	1,200
20x4.33R	13,981
17x5.0	11,607
20x5.0	40,869
15x5.00S	2,245
18x5.00S	2,533
20x5.00S	249,195
20x6.0	61,009
20x6.00S	30,382
20x6.00T	41,660
22x6.00T	157
24x6.00T	337
18x7.0	919
20x7.0	4,985
20x7.00T	4,745
22x7.00T	1,619
20x7.33V	57,031
22x7.33V	13,097
20x7.5	8,071
19x8.37	2,418
20x8.37	756
24x8.37	3,798
Semi- D. C. Truck	
16x4.50E	47,947
15x5.50E	14,405
16x5.50F	4,590
15x6.00G	195
16x6.00G	3,816
Tractor & Implement	
12x2.50C	8,230
12x3.00D	20,396
15x3.00D	51,846
16x3.00D	13,823
19x3.00D	9,284
18x5.50F	17,780
20x5.50F	4,738
24x5.50R	3,012
24x8.00T	1,400
28x8.00T	343
W8-24	16,241
W9-24	3,508
W9-28	6,276
W9-36	1,023
W9-38	4,857
W10-28	820
W10-38	1,255
W11-24	1,705
W11-28	324
DW9-34	11
DW9-38	11,120
DW10-36	144
DW10-38	11,394
DW11-28	4,262
DW11-38	6,387
DW12-26	1,081
DW12-30	3,064
DW12-34	1,614
DW16-26	905
Earth Mover	
24x15.00	611
Total	2,593,602

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DEVELOPMENT CHEMIST, FOR LATEX COMPOUNDING. GIVE full information including education, experience, and salary desired in first letter. Eastern location. Address Box No. 909, care of INDIA RUBBER WORLD.

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(Classified Advertisements Continued on Page 719)

United States Rubber Statistics

(All Figures in Long Tons, Dry Weight)

	February, 1947						March, 1947					
	New Supply			Distribution		Stocks, End	New Supply			Distribution		Stocks, End
	Production	Imports	Total	Consumption	Exports	of Month	Production	Imports	Total	Consumption	Exports	of Month
Natural Rubber: Total	....	29,077	29,077	40,270	0	277,687	....	39,949	39,949	42,465	0	275,171
Smoked sheets*	....	6,591	6,591	18,168	0	115,548	....	7,065	7,065	16,571	0	106,078
Thin crepe*	....	14	14	117	0	2,352	....	0	0	119	0	2,233
Thick crepe*	....	1,525	1,525	454	0	8,614	....	802	802	598	0	8,818
All other	....	20,947	20,947	21,531	0	151,137	....	32,082	32,082	25,177	0	158,042
Natural Latex: Total	....	1,241	1,241	713	47	5,792	....	488	488	639	Below 0.5	5,641
Normal	....	0	0	47	0	106	....	0	0	12	0	94
Centrifuged	....	1,241	1,241	665	47	5,679	....	488	488	626	Below 0.5	5,541
Creamed	....	0	0	1	0	7	....	0	0	1	0	6
Natural Rubber and Natural Latex: Total	....	30,318	30,318	40,983	47	283,479	....	40,437	40,437	43,204	Below 0.5	280,812
Synthetic Rubber: Total	57,811† 1,314‡	0	59,125	53,321	2,166	120,188	55,718† 1,760‡	0	57,478	55,514	704	121,448
GR-S	49,324† 53‡	0	49,377	42,407	1,743	89,729§	46,496† 233‡	0	46,729	44,245	516	91,697§
Butyl	6,349†	0	6,349	6,638	3	18,950	6,931†	0	6,931	7,215	Below 0.5	18,666
Neoprene	2,138† 811‡	0	2,949	3,832	418	8,088	2,291† 989‡	0	3,280	3,669	120	7,579
Nitrile types	450‡	0	450	444	2	3,421	538	0	538	385	68	3,506
Natural Rubber and Latex, and Synthetic Rubber: Total	59,125	30,318	89,443	94,304	2,213	403,667	57,478	40,437	97,915	98,618	704	402,260
Reclaimed Rubber	23,990	0	23,990	25,484	1,142	27,417	26,209	0	26,209	26,157	1,268	31,940¶
Grand Totals	83,115	30,318	113,433	119,788	3,355	431,084	83,687	40,437	124,124	124,775	1,972	434,200

* No. 2 grade or better.
† Government plant production.
‡ Private plant production.
§ Includes stocks shipped for export, but not cleared.
¶ Includes 5,739 long tons inventory adjustment.

Malayan Rubber Statistics

The following statistics for May, 1947, have been received from Singapore by way of Malaya House, 57 Trafalgar Square, London, W.C.2, England.

Ocean Shipments from Singapore and Malayan Union—In Tons

	Sheet and Crepe			Latex, Concentrated Latex, and Revertex (Dry Rubber Content)		
		Malayan Union			Malayan Union	
To	Singapore Export Proper	Transshipped	Direct Shipments	Singapore Export Proper	Transshipped	Direct Shipments
Argentine Republic	558	73	3,802	27	....	....
Australia	1,417	453	706	7	41	....
Belgium	545	219	510	8	....	....
Canada	390	25	339	141	8	....
Chile	76	....	75	....	....	....
China	383	....	78	....	....	....
Cuba	106	....	....	2	....	....
Cyprus	....	....	25	....	....	....
Czechoslovakia	508	....	26	1	....	....
Denmark	315	....	60	2	3	....
Egypt	42	25	25	1	....	....
Finland	....	....	225	10	....	....
France	2,258	....	1,595	60	82	....
Germany	....	....	300	....	....	....
Hong Kong	2,159	....	191	....	....	....
Hungary	....	....	....	6	....	....
Italy	600	52	244	6	....	....
Japan	2,500	....	100	33	....	....
Mexico	45	....	....	....	....	....
Netherlands	286	53	111	19	....	....
New Zealand	361	....	15	6	30	4
Norway	31	....	202	5	....	....
Other British countries in Asia	40	2	....	....	....	....
Africa	1	....	....	....	....	....
Countries in South America	225	100	14	15	....	....
Palestine	5	....	17	....	....	....
Portugal	10	....	....	....	....	....
Russia	3,238	....	2,763	....	....	....
Spain	650	50	775	26	....	....
Sweden	591	174	525	13	....	....
Switzerland	18	....	....	4	....	....
Syria	5	....	....	....	....	....
Turkey	40	....	68	....	....	....
Union of South Africa	220	132	457	1	1	....
United Kingdom	2,969	528	7,889	695	....	....
U. S. A.	24,806	2,297	23,305	360	....	316
Venezuela	....	....	5	....	....	....
TOTAL	45,398	4,183	44,447	1,448	165	320
GRAND TOTAL		94,028			1,933	

Foreign Imports of Rubber in Long Tons

Singapore Imports from	Dry Rubber	Wet Rubber (Dry Weight)
Banka and Billiton	192	6
Brunei	100	4
Dutch Borneo	2,106	93
French Indo-China	77	49
Java	200	....
North Borneo	697	51
Other Dutch Islands	95	8
Rhio Residency	416	11
Sarawak	1,639	11
Siam	1,375	78
Sumatra	9,333	7,294
TOTAL	16,230	7,605
Malayan Union Imports from		
Burma	486	59
Dutch Borneo	1	....
Siam	964	22
Sumatra	2,177	1,168
TOTAL	3,628	1,249

Dealers' Stocks

	Tons
Singapore	57,246
Penang & Province Wellesley	15,461
TOTAL	72,707

Port Stocks in Private Lighters and Railway Godowns

	Tons
Penang & Province Wellesley	7,959
Port Swettenham	2,298
Singapore	7,723
TOTAL	17,980

Foreign Trade Opportunities

(Continued from page 690)

Société Superflexit, 2 Rue du Parc, Bois-Colombes (Seine), France: machinery for processing synthetic rubber, and plastics, synthetic rubber, plastic materials.

Rustomjee, Sons, "Hoshang House," 70-C, Gowalia Tank, Bombay 26, India: upholstery material, rubber material for padding seats.

Maison Longini, 33 Rue du Compas, Brussels, Belgium: rubber and plastic seat pads.

Cairo Scientific Instruments, 2 Sharia Eloui, Cairo, Egypt: wires, cables, electrical household appliances.

Union Rubber Co., Ltd., 5-7 Trok Rong Phim Lane, Jawarad Rd., Bangkok, Siam: pharmaceuticals.

J. L. Clark & Co., P. O. Box 7787, Johannesburg, Union of South Africa: pencils, fountain pens, erasers, general stationery lines.

Europ-Impex, 116 Rue de Treves, Brussels, Belgium: elastic webbing.

Harry J. Gildred, Rivadavia 409, Buenos Aires, Argentina: cement, plastics, aeronautical products.

Harry Louis, representing Reliance Footwear (Pty.) Ltd., 46 Main St., Port Elizabeth, Union of South Africa: footwear and materials and machinery for the shoe industry.

John Fenwick Crosby, representing Kenworth (Aust.) Pty. Ltd., 181 Lennox St., Richmond, Melbourne, Victoria, Australia: methods of rubber manufacture and raw materials therefor.

Irse Mencacci, representing Cia. Importadora de Produtos Americanos "Cipra," 1404-166 Rua Brigadeiro Tobias, Sao Paulo, Brazil: automobile parts and accessories.

W. Kredian, representing W. & A. Kredian, 11 Sharia Nassouh Pasha, P. O. Box 22, Zeitoun, Egypt: plastic machinery, presses, molding powders, toys.

Philippe Deros, 3 Blvd. Richard Wallace, Neuilly-sur-Seine, Seine, France: plastics.

Amar Singh Pannu, representing Rose & Co., Sialkot City, Punjab, India: sporting goods, general merchandise.

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CLASSIFIED ADVERTISEMENTS

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FOR SALE: SINGLE DECK, 24 CARRIER BRAIDING MACHINE manufactured by the Textile Machine Works; 9″ dia. horn gear, complete with bobbin spring tension. additional bobbins and spooling machine; suitable for braiding copper or steel wire jacket, brand new, has never been used. Address Box No. 911, care of INDIA RUBBER WORLD.

FOR SALE: 1 JOLLY BALANCE, CENTRAL SCIENTIFIC CAT. #7500. Used, but in excellent condition. Price $50 f.o.b. Lima, Ohio. GRO-CORD RUBBER CO.

FOR SALE: 1—30 x 30 FARREL MASTICATOR; 1—#9 BANBURY Mixer; 2—60″ Mills; 2—42″ Mills; 2—36″ Mills; 1 Experimental Mill; 1 Farrel 54″ Calender; 1 two-roll 42″ Calender; 1 Doubling Calender; 1 Waldron Spreader; 4 Standard Spreaders; 6—200-gallon Churns; 3—40-gallon Pony Mixers; 1 Saturating Machine; 4—30 x 30 Hydraulic Presses; 1—36″ x 36″ Press; 3—24″ x 24″ Presses; 6 12 x 12 Presses; Heel Trimming Machines; Lot of Heel Molds; 1 W. & P. Mixer; Lot Stainless-Steel-Lined Jacketed Kettles; 1 Goose-Neck Hydraulic Press, 20″ x 10′ size; Rubber Bale Cutter; 2 Vulcanizers; 1 Can Drying Machine. Address Box No. 912, care of INDIA RUBBER WORLD.

FOR SALE: ONE DEVULCANIZER, 5′ DIAMETER, 25′ LONG. Tested for 125 lbs.′ pressure. Address Box No. 913, care of INDIA RUBBER WORLD.

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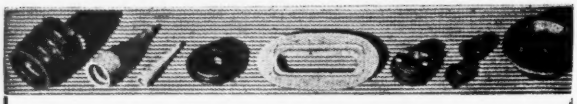

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Dominion of Canada Statistics

Imports of Crude and Manufactured Rubber

	May, 1947		May, 1946	
UNMANUFACTURED	Quantity	Value	Quantity	Value
Balata ..... lbs.	5,310	$ 2,855	5,679	$ 4,171
Crude rubber ..... lbs.	10,974,953	2,238,527	1,451,225	238,777
Gutta percha ..... lbs.	.....	.....	1,000	2,939
Latex ..... lbs.	80,365	26,642	121,267	62,989
Rubber, powdered and waste ..... lbs.	1,986,500	40,669	573,700	11,050
Recovered ..... lbs.	2,201,100	175,609	2,567,100	200,047
Synthetic and substitute ..... lbs.	399,400	95,279	565,200	158,138
TOTALS.	15,647,628	$2,579,581	5,285,071	$ 678,111
PARTLY MANUFACTURED				
Comb blanks of hard rubber	.....	$ 2,393	.....	$ .....
Hard rubber in rods or tubes ..... lbs.	1,483	1,540	1,106	859
Rubber thread, not covered ..... lbs.	4,617	4,287	5,773	8,521
TOTALS.	6,100	$ 8,220	6,879	$ 9,380
MANUFACTURED				
Bathing shoes ..... prs.	3,264	$ 1,520	.....	$ .....
Belting	.....	54,679	.....	54,241
Boots and shoes of rubber n.o.p. ..... prs.	459,639	711,311	290,005	433,689
Canvas shoes with rubber soles ..... prs.	668	1,313	72	165
Cement	.....	59,025	.....	38,356
Clothing of waterproofed cotton or rubber	.....	6,897	.....	939
Druggists' sundries	.....	69,306	.....	37,454
Gaskets and washers.....	.....	23,556	.....	15,312
Gloves ..... doz. prs.	1,524	6,577	565	2,592
Golf balls ..... doz.	1,699	8,389	49	188
Heels ..... prs.	9,845	834	3,661	402
Hose	.....	48,297	.....	26,011
Hot water bottles.....	.....	5,208	.....	1,224
Inner tubes, n.o.p ..... no.	8,791	15,345	173	3,020
Bicycles ..... no.	1,383	942	1,300	942
Liquid sealing compound..	.....	11,257	.....	9,176
Mats and matting.....	.....	33,022	.....	20,322
Nursing nipples ..... gross	1,566	4,238	794	2,884
Packing	.....	21,525	.....	11,191
Raincoats ..... no.	148	595	.....	.....
Tires, pneumatic, n.o.p. no.	12,565	213,322	585	36,049
Bicycles ..... no.	2,317	3,258	1,508	2,004
Solid for automobiles and motor trucks no. ..	10	365	23	1,488
Other	.....	6,834	.....	2,405
Tire repair material.....	.....	20,522	.....	6,147
Other rubber manufactures	.....	305,296	.....	249,305
TOTALS.	.....	$936,706	.....	$525,305
TOTAL RUBBER IMPORTS.	.....	$3,524,507	.....	$1,213,201

Exports of Crude and Manufactured Rubber

UNMANUFACTURED				
Crude rubber ..... lbs.	6,097,378	$1,128,057	1,840,929	$372,529
Waste rubber ..... lbs.	1,921,200	25,361	1,613,800	28,140
TOTALS.	8,018,578	$1,153,418	3,454,729	$400,669
PARTLY MANUFACTURED				
Soling slabs of rubber .lbs.	2,622	749	23,540	6,956
MANUFACTURED				
Belting ..... lbs.	342,530	227,063	253,168	155,641
Belts, fan	.....	9,135	.....	5,344
Boots and shoes of rubber n.o.p ..... prs	459,639	711,331	290,005	433,689
Canvas shoes with rubber soles ..... prs.	452,673	408,167	116,373	110,400
Clothing of rubber and waterproofed clothing	.....	59,305	.....	79,693
Heels ..... prs.	133,108	10,040	194,995	18,621
Hose	.....	88,636	.....	54,738
Inner tubes for motor vehicles ..... no.	81,879	179,941	60,984	124,123
Soles ..... prs.	20,376	6,348	13,689	3,418
Tires, pneumatic, for motor vehicles ..... no.	52,769	1,009,108	43,411	920,683
Other ..... no.	15,691	13,698	6,575	5,659
Wire and cable, copper, insulated	.....	193,921	.....	171,929
Other rubber manufactures.	.....	113,441	.....	66,328
TOTALS.	.....	$3,030,128	.....	$2,150,266
TOTAL RUBBER EXPORTS.	.....	$4,418,295	.....	$2,557,891

Publications of Resinous Products & Chemical Co., Washington Sq., Philadelphia 5, Pa. **"Paraplex G-25 and G-40."** 14 pages. Information is given on these resinous polyester plasticizers, including their properties and use in vinyl resins and nitrile and neoprene rubbers. Data cover results obtained with resin and rubber stocks using these plasticizers. **"Paraplex for Laminating and Casting Applications."** 24 pages. The properties and industrial applications of the Paraplex "P" series resins are included herein. Both cured and uncured resins are described, and techniques for casting and laminating are detailed.

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WANTED: ONE OR MORE CABLE BRAIDERS, #1 OR 2—64 Carriers, tubular, to braid over 1¼" hose. Reply, specifying make, price, and where to be seen. Address Box No. 917, care of INDIA RUBBER WORLD.

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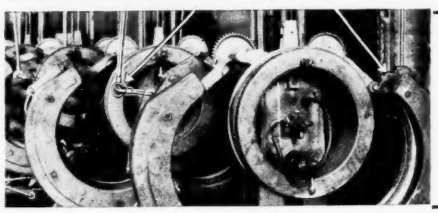

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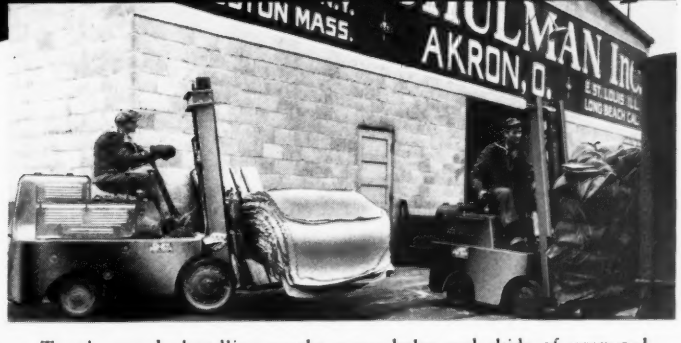

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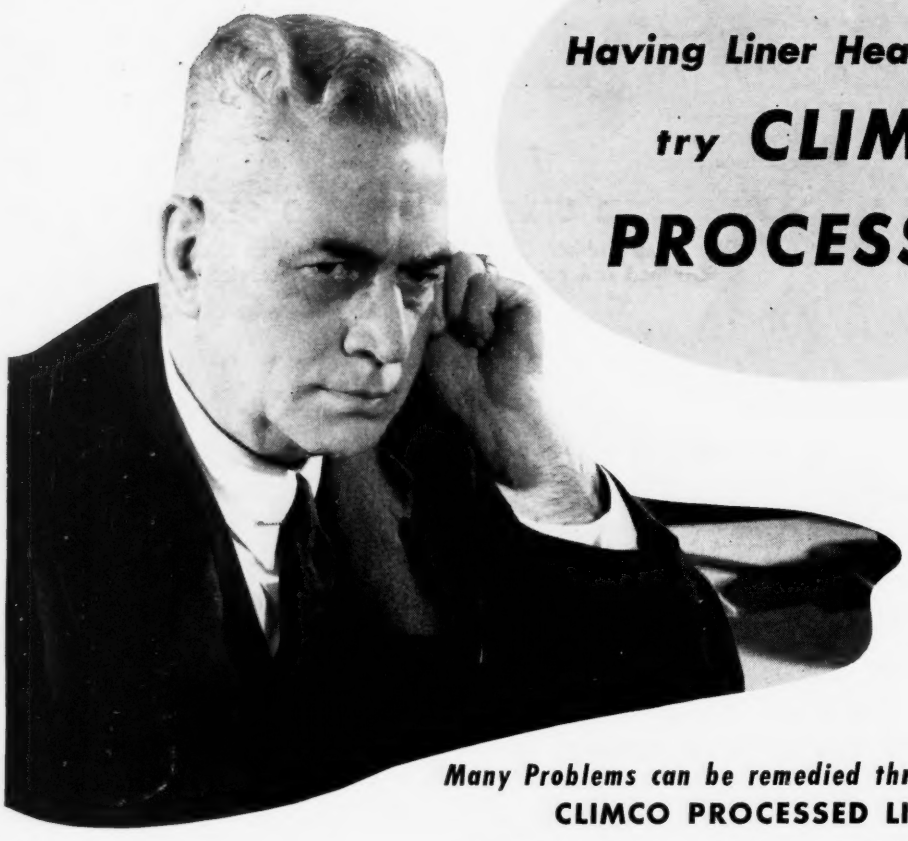

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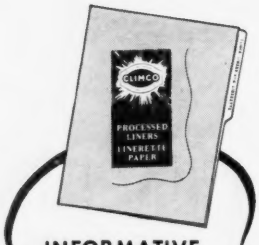

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